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THE HANDYMAN AT WORK

INTRODUCTION

It does not matter very much what particular form the pastime may take—whether it be woodworking, metalworking, household decoration, gardening or any other of the numerous spare-time occupations—the man with a hobby is generally far happier, more resourceful and better able to think things out for himself than one who has no interest in anything other than his usual routine of work, meals and sleep.

The man who can use tools properly is to be envied, for the field in which he can exercise his ability and skill is practically unlimited. He need never be bored for lack of something to do. There are hundreds of useful things to be made out of doors during the summer months and innumerable articles which can be constructed in the shelter of a room or workshop during the long evenings of winter.

And not only does such employment occupy spare time in a pleasant manner and satisfy the natural instinct to create something with one's own hands, but it is possible to make such recreations pay for themselves. Numerous cases can be instanced where new tools and equipment have been procured out of small commissions—such as making or repairing articles of furniture, decorating rooms, cycle repairing and what not; and many an amateur has looked to his tools as a temporary means of earning a livelihood when other ways have failed.

The man who selects carpentry as a means of occupying his spare time is to be congratulated on his choice, for few crafts involving the use of tools offer more variety. Moreover, working in wood has the advantage of promoting much healthy physical exercise. Each kind of handiwork, however, has its own peculiar charm and usefulness; and it would be useless further to stress their relative merits.

Before starting on work of a practical nature it may be as well to acquaint yourself with the following hints.

First you must be familiar with, and know how to use the numerous tools employed and the properties of materials used. Remember that no amount of description will teach you half so much as the actual work.

Make up your mind at the outset to be methodical in your work, otherwise your efforts may become a bore rather than an interesting and pleasant pastime. In woodwork, for example, if you have several parts to be glued, do all the gluing at one operation, as it is a waste of time and energy to continue to re-heat and prepare glue. The same thing applies, of course, to metalwork as instanced in the process of soldering. First prepare all the parts to be soldered and then carry on with the soldering.

Make a point of being accurate in your measurements and marking out, and always check such dimensions before starting any mechanical operations, bearing in mind that it is easier to reduce the size of a piece of work than to increase it. A little forethought bestowed upon the work in hand will often be the means of saving much unnecessary labour and will tend towards economy in material. It is extremely annoying to find a piece of work, which may have taken hours of patient labour to execute, condemned to the scrap-heap on account of a small error in measurement having been made at the start. Such errors are generally the result of being in too much of a hurry and of not paying attention to detail. Take things steadily and do not rush at the task. The old adage "More haste less speed" applies truly to work of mechanical nature.

An important preliminary is the preparation of working drawings. Before starting on any work, always make a sketch or working drawing of the object you intend to construct. It may happen that you wish to make a certain article or piece of apparatus of your own design, in which case a working drawing is almost a necessity. It is much easier to alter a drawing if some detail or other does not suit than to alter or make fresh parts during construction.

If you are faced with a difficult problem, do not let it get the better of you, but make up your mind to master it and never hesitate to seek advice from a skilled worker. Much can be learned by watching skilled men at work; therefore, always make a point of keeping your eyes open and of making a mental note of what you see.

An example of how easily information can be gained if sought is instanced in the following: A keen amateur who found much pleasure in "tinkering" with small organs of the reed type wished to add a number of wooden pipes and thus enlarge the capacity of his instrument. Thinking over the proposition, he realised that there must be a snag somewhere, otherwise professional builders of organs would adopt this simple combination of harmonium, reed and pipes in their large instruments. He made it his business to find out by paying a visit to an organ factory. Here, the proprietor at once informed him that the idea was impracticable as it would be necessary to retune the pipes to the reeds practically every time the instrument was played.

The moral to be learned from the above is obvious. Do not go ahead with a scheme if you have any misgiving, when a little extra knowledge may make all the difference.

Here are a further two suggestions worth following: Always keep your tools under lock and key and do not make a habit of lending them. You will then have only yourself to blame if tools are missing, and they will not be damaged by inexperienced hands.

Do not start on a difficult piece of work until you can make a perfect job of a simple one. Furthermore, do not begrudge the little extra time expended in finishing off work neatly. A few minutes extra labour generally determines the dividing line between good and bad craftsmanship. Get into the habit of always completing the work in hand before starting upon anything new, because one completed object is of more use than a dozen unfinished.

Some of the materials mentioned in the present edition may not easily be obtainable during periods of short supply. However, in many instances it will be possible to use alternative materials without seriously affecting the results of the work described.

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THINGS FOR THE WOOD-WORKER TO DO

THE BEST WAY TO PURCHASE WOODWORKING TOOLS

HIGH-GRADE tools are essential. Hence it is wise to obtain your kit from a dealer who specialises in tools, and not be tempted in purchasing tools from a store where low prices are the chief consideration and quality an afterthought.

Although you yourself may be able to afford a full equipment of tools at the outset, there are hosts of others who cannot. In this case, there is no better plan than to purchase a few of the essentials and then acquire the remainder singly as the necessity arises. This method fosters economy inasmuch as it prevents the purchase of superfluous tools; that is to say, those which are required only on very rare occasions.

Second-hand tools are sometimes offered for sale at bargain prices, but it is unwise to purchase such articles unless you are competent to judge good tools.

A Beginner's Outfit.—Here is a list of the most important tools to enable you to make a good start in simple woodwork.

Hand Saw, 20 in.	At current prices
Tenon Saw, 10 in.	
Jack Plane, in metal, 2 in. double iron..	
Smoothing Plane, metal, with adjustable iron	
Pad Saw and Blade	
Brace, ratchet type, 8 in. sweep ball bearings	
$\frac{1}{2}$ doz. Bits	
5 Firmer Chisels, $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$ in.	
Gouge, $\frac{1}{2}$ in. externally ground	
Spokeshave	
Screwdrivers, 4 in. and 9 in. blades	
Try Square	
Marking Gauge	
Hammer, Warrington pattern	
Nail Punch	
Pincers	
Oilstone, 8 × 2 × 1 in. ..	
Mallet	
Gimlets, small and medium sizes	
Bradawls, small and medium sizes..	
Rule, 2 ft. four-fold type ..	

The tools mentioned in the above list should be of really good quality which, if properly looked after, should give years of service. Their cost could be cut down considerably if wooden planes were substituted for metal ones, but this would be false economy.

Tools for Advanced Work.—In due course, as progress is made, the following items will be found of great assistance:

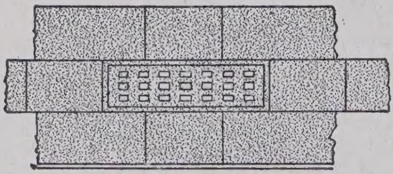
$\frac{3}{8}$ in. Jointer Plane	At current prices
Combination Plane, Metal ..	
Small Block Plane, double ended	

Hand Drill-stock and Twist-drills	At current prices
Wing Compasses	
Rip Saw	
Set of Jennings' pattern Twist-bits in Canvas Roll	
Cutting Pliers..	
Light Hammer	
Adjustable Bevel	
Mortice Gauge	
Spirit Level	
Fretsaw	
Grindstone	

A strong work bench fitted with an adjustable vice in front for gripping material and an adjustable stop on top for work to butt against are essential items of the woodworker's equipment. Such a bench can be purchased ready made, but it is likely to prove a rather expensive item. The obvious alternative is for the amateur to make one himself. It is a task which should be well within the scope of almost anyone. As the construction of a work bench is simple and does not entail extreme accuracy, the beginner should make a point of starting his woodworking career by making one. Care must be taken not to make it too light and flimsy. A work bench should be rigid and of sufficient weight to keep it in place when in use. Other accessories such as mitre block, shooting board, winding strips, straight-edge, and cramps can all be home constructed.

HINTS ON TOOLS, MATERIALS AND PROCESSES

The following short articles on tools, materials, processes and items of interest to the amateur woodworker, metalworker, electrician and others have been arranged alphabetically for easy reference and should be read by the novice before making or proceeding with any of the useful things contained in this volume.



Air Brick

Air Brick.—A cast iron grating of the same size as a brick (see figure) has replaced the old-fashioned air brick with holes for ventilation purposes. Its chief use is to allow a current of air to pass from the outside into the space under the ground floors of buildings. Stagnant air in such spaces is conducive to dry rot. For this reason it is all important to see that such bricks are not allowed to become blocked up either with old leaves or soil. Broken grids should be replaced, as large apertures are likely to entice vermin.

Aluminium.—A whitish coloured metal produced in the electric furnace. It is the lightest metal in common use, being only about one-third the weight of iron. Non-corrodable, soft and easy to work. Aluminium cannot be soldered unless a proper flux is used, owing to a film of oxide which forms on the surface. The metal is easy to turn in the lathe, but unless the turning tool is very keen, particles of metal adhere to the cutting edge of the tool.

Turpentine is good to use when turning, drilling and screwing. Paraffin can be used, but is not so effective.

American Whitewood. — Often called canary wood, is of a yellowish-white colour. Although classified as a hardwood is really soft. It is of even texture, straight grained and fairly easy to work. Excellent for cabinet and other interior work. Can be stained and polished to imitate other more expensive woods and is used largely in cheap cabinet making, shopfitting, etc. Can be obtained in wide boards.

Bass wood resembles whitewood but is lighter in colour and softer.

Annealing.—Annealing or softening metals is sometimes required to make them workable. To anneal steel, heat it to a cherry red and allow to cool slowly in ashes or similar material. Copper and silver is softened by heating it up to a dull red heat and then plunging it in clean cold water. Brass can be annealed by heating it up to a dull red colour and then immersing it in warm water and allowing it to remain there until cold. On no account should brass or copper be heated to above the stage given, otherwise it may be burned.

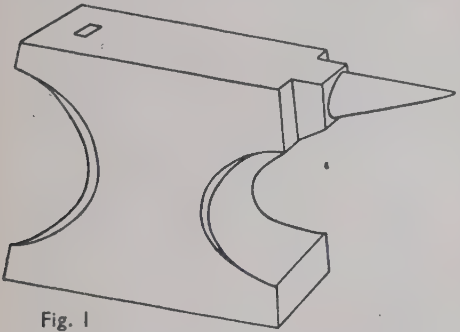


Fig. 1

Anvil.—A shaped iron block having a hardened steel face (see Fig. 1) used principally by smiths for hammering upon. Such a tool will be found extremely useful in amateurs' workshops for such purposes as straightening out dents in sheet metal, straightening bars, and for giving a solid foundation when clinching nails. Anvils are rather expensive to buy, but one of a good quality measuring 8½ in. by 2½ in. and weighing 15 lb. is required.

As an anvil requires a solid foundation it should be mounted upon a tree butt, but an oil drum filled with sand makes a good substitute.

For light work a domestic iron held in the vice (Fig. 2) is useful as a makeshift.

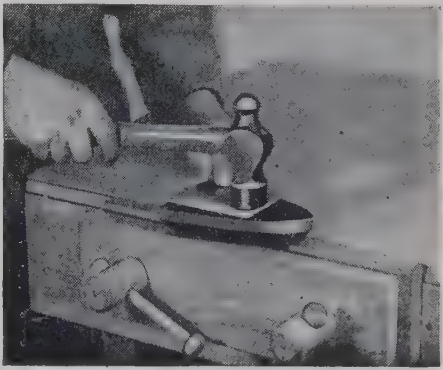


Fig. 2

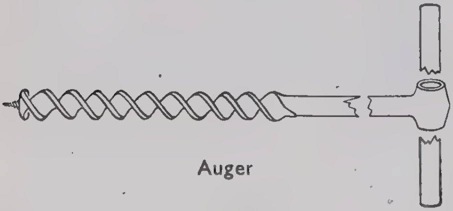
Asbestos. — An incombustible mineral of great importance owing to its heat-resisting qualities. Its chief use from the practical man's point of view is perhaps in the form of asbestos-cement sheets which make a highly satisfactory cladding for garages, sheds and even bungalows. Such sheets are to be obtained in two standard sizes, 8 × 4 ft. and 6 × 4 ft. respectively and in thickness of $\frac{3}{16}$, $\frac{1}{4}$, $\frac{3}{8}$ in.

In fixing asbestos-cement sheets to framework it is important to see that the uprights are not spaced too far apart. A maximum of 2 ft. should not be exceeded. An allowance of about $\frac{1}{16}$ in. should be made between the joints to enable the nails of a covering batten to pass into the framework. New sheets are comparatively soft and nails may be driven into them with ease, but they become brittle with age and it is therefore necessary to drill nail holes before fixing. Galvanised wire nails about 1½ in. long driven in at intervals of about 8 in. will make a sound job.

To cut new sheets use an old cross-cutting saw; for old material score it deeply with the corner of a triangular file guided by a straight-edge. A great saving of material will be effected if window openings, etc., are arranged to come between joints. Where this is not possible it is a good plan to cover such apertures and then remove the waste with the aid of a pad saw.

A pleasing finish can be obtained by allowing the rough side of the sheets to be painted and face the outside of the structure instead of erecting the sheets smooth side out, which is more usual.

Corrugated sheeting for roofing is also to be had which allows of a more even temperature within the structure than does galvanised iron.


Auger

Asbestos cement slates are also excellent for covering roofs, while ridge tiles of the same material are to be obtained at most builders' merchants.

Owing to the heat-resisting qualities of asbestos, it is used extensively for lagging or jacketing boilers, hot-water pipes, domestic cylinders, etc. A hot-water system can very often be much improved by its use. For this, asbestos is mixed with water to make a thick paste. It is then put on with a trowel. To ensure a good job, three applications giving a total thickness of 2½ in. should be made and should be put on while the apparatus is hot. The first one should be about ½ in. thick and can be rough and allowed to dry. Then the second layer can be given, and when dry narrow wire mesh netting should be securely bound on to prevent the finishing layer from peeling off. The final coat should be smooth and painted black when dry. Asbestos mats can be obtained for lagging purposes.

Ash.—A hardwood of light brown colour, straight grained and very tough. Durable if kept dry and very elastic. Owing to this latter feature it is not used for constructional work, but is excellent for such articles as oars, shafts of tools, spokes of wheels and other things where elasticity is needed.

Arris.—The edge of wood forming the angle between two exterior faces. This sharp edge should always be removed to prevent cut fingers. This can be done either by a plane held at an angle to chamfer the edge slightly or by a special tool called a cornering tool.

Auger.—A woodwork tool resembling a twist-bit used for boring long holes, as indicated in the figure. A hole is provided at the top of the shank through which a piece of round hardwood or a metal bar is inserted to obtain leverage. In use, augers in good condition do not require pressure after the screw point has entered the wood, the cone-shaped screw point drawing the tool into the material as the handle is rotated. These tools can be obtained for cutting holes from ⅜ in. to 2 in. in diameter.

Batten.—A term given to lengths of timber varying in width from 1½ in. to 3 in. and from ½ in. to 1¼ in. in thickness. Used largely as a fixing for roofing tiles. Can be obtained sawn or prepared, i.e., planed. Battens are extremely useful for making light framework. Lengths of prepared batten, spaced at equal distances apart on horizontal rails, make excellent palings for fences.

Beech.—A hardwood of yellowish-white to brown colour, most of which is produced in Great Britain. Very tough and splits easily, hard and has a compact grain. Excellent for wood-turning and wooden parts of tools, chairs, cabinet work. Durable if permanently wet or dry; otherwise it is subject to rot.

Bells, Electric.—An electric bell is one of the most useful devices in the home, and provided it is kept in proper adjustment and installed in a dry place uncontaminated by steam or gas fumes, will give good service for years.

The principle upon which an electric bell works can be readily understood by referring to Fig. 1, which shows diagrammatically a bell connected to a battery and push.

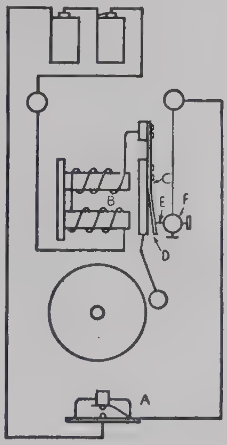


Fig. 1

When the button of the push A is pressed a current flows through the coils and magnetises the soft iron pole pieces of the electro-magnet B and attracts the armature C. The armature carries a spring contact D resting normally against a pointed contact screw E held in position by a metal pillar F. The movement of the armature towards the magnet automatically breaks the circuit at the contacts and causes the armature C to which the hammer is attached to fly back to its original position, and it continues to vibrate as long as the button is pressed.

In the course of time the bell will possibly fail, and this is usually caused by the contacts becoming pitted owing to a minute spark which takes place at these points when the circuit is broken by the armature.

To remedy this defect remove the contact screw and give the point a rub with a piece of fine glass-paper and treat the armature contact in the same way. Corroded terminals will often cause a failure, so the preventative is to keep them clean.

Fig. 2 shows three diagrams of useful circuits in connection with electric bells.

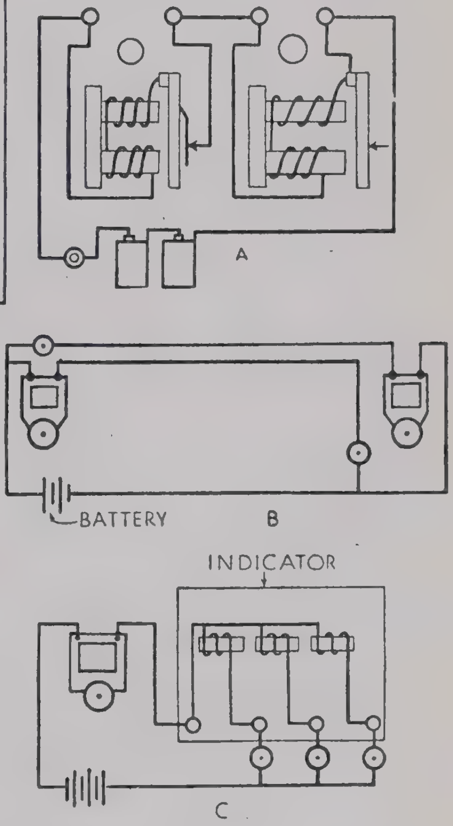


Fig. 2

That illustrated at A shows an additional bell to ring simultaneously. Note that there is no connection with the contact breaker of bell 2 as the impulses from the coils of the first bell cause similar impulses in the coils of the second.

That at B is a diagram of connection of two bells fed from a single battery and each operated by a distant push.

The connections of an indicator and bell as commonly used in a house installation is represented at C.

Bench.—A substantial and serviceable bench is essential for woodworking and metalworking. The simple one illustrated at Fig. 1 will serve all ordinary requirements. Such a bench is fairly expensive when ready made, but by making it yourself you will save more than half the cost. It consists of two end frames formed by the legs and top and bottom cross rails, two long rails, one at the back and one at the front, fixed to the lower ends of the legs at the proper distance apart and a back and front board fixed to the legs and the bench top to give strength and stability.

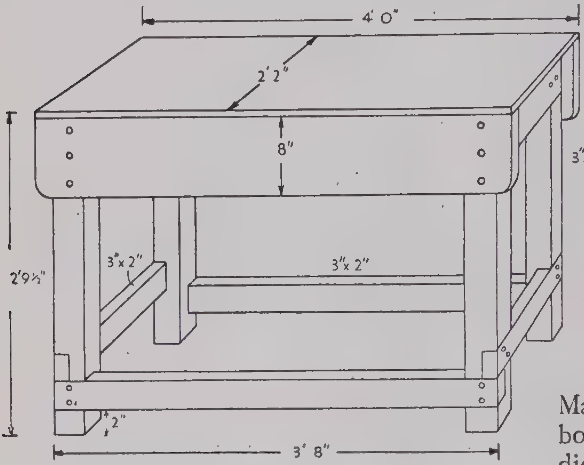


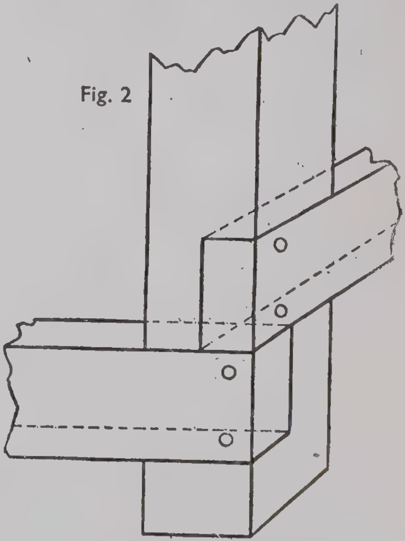
Fig. 1

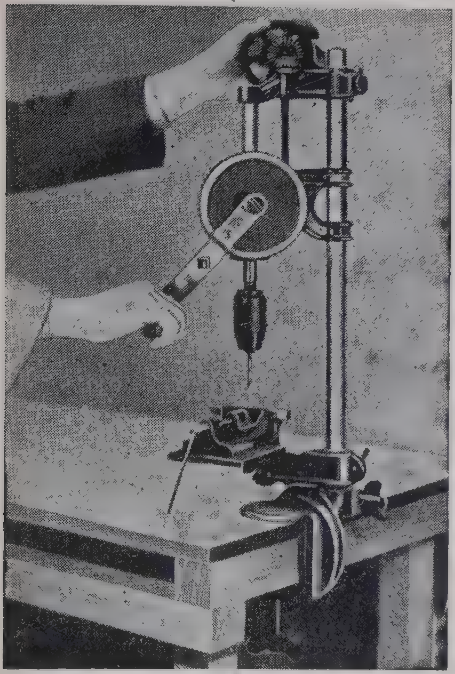
The timber required which should be best quality yellow deal is as follows. An 11 ft. length of 3×3 in. for the legs, two 8 ft. lengths of 3×2 in. for the front and back rails and side rails, three boards each 9 in. wide × $1\frac{1}{2}$ in. thick for the top and two boards 8 × 1 in. for the front and back boards.

It is advisable to get prepared stuff; that is wood already planed by machines. This will save a lot of planing, but the sizes will be $\frac{1}{8}$ in. smaller in the thickness and width other than those specified owing to waste. Thus the legs only "hold up" $2\frac{7}{8}$ in. square and the top boards $1\frac{3}{8}$ in. thick × $8\frac{7}{8}$ in. wide. These smaller dimensions, however, are of little consequence as accuracy is not essential.

Mark and cut the legs, side and bottom rails to true length, making sure that the ends are perfectly square, then mark the two end frames. Note that the rails are halved into the legs and fixed by screws in the manner shown in Fig. 2. Mark and cut the front and back boards, round the ends as indicated to give a finish, and then fix them to the end frames, using countersunk-headed screws driven well below the surface. Now measure the overall width and plane the outside edges of the top boards to correspond and screw them down to the tops of the end frames and the front and back boards, sinking

Fig. 2



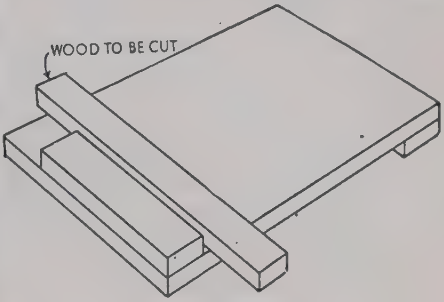


Bench Drill

the screws well below the surface. These come flush with the outside of the front and back boards. The top should then be skimmed over with a smoothing plane. The final operation consists of fitting a bench vice to the front board and a stop near the front and about 6 in. from the left-hand end of the top.

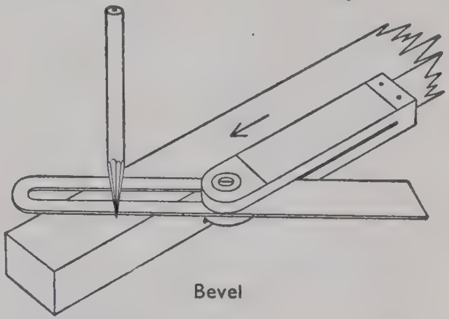
Bench Drill.—To drill holes accurately in metal by hand-operated tools is a difficult job, especially when the tool has to be kept perfectly upright when drilling. This obstacle is easily got over by using a bench drill such as the one illustrated in the figure. This type of machine is a handy tool for the amateur, as the swivelling vice below the drill chuck enables the work to be held in any desired position. The chuck holds drills up to ⅜ in. in diameter and is fed down to the work by a wheel-operated screw.

Bench Hook.—This almost indispensable woodworking device is used for steadying the work on the bench when sawing across the grain of wood. It is easily constructed by fixing a batten at the edge of the top face and a similar batten underneath the bottom edge of a piece of planed board in the position shown in the figure. The work is held against the top stop while the lower battens rest against the front edge of the bench.



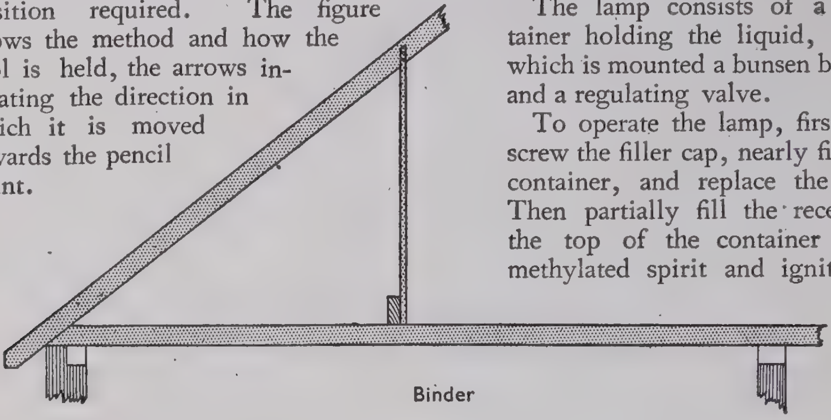
Bench Hook

Bevel.—An adjustable bevel (see figure) is a useful woodworking tool employed for marking and setting out angles. It consists of a slotted steel blade held in position by a bolt passing through the top of the stock or body of the tool, and a lock-nut which keeps it in position. The inner face of the stock is lined with brass to prevent wear. After having been set to the desired angle the tool is used in very much the same way as a try square;



Bevel

that is, the stock, held in the left hand, is run along the edge of the wood until it touches the point of the pencil which is held in the right hand and resting on the face edge of the work in the position required. The figure shows the method and how the tool is held, the arrows indicating the direction in which it is moved towards the pencil point.



Binder

Binder.—A length of wood or a steel beam fixed across and above the top floor joists and sometimes suspended from the rafters by ties to prevent the ceiling to which they are attached from sagging. The Diagram shows the arrangement.

Blocks, Glue.—Glue blocks are simply short lengths of wood cut from hardwood moulding of triangular section. They are used for strengthening the joints at the internal angles of woodwork.

Glue blocks can be obtained at most shops which cater for woodworkers. Stock sizes are ½, ¾, and 1½ in.

Blow-lamps.—The practical man will find that the money spent on a blow-lamp is not misspent. It will prove handy for numerous jobs and is invaluable for heating a soldering iron, burning off paint, plumbing, and other purposes where a hot clear flame is required. Fig. 1 shows a typical blow-lamp of good make, and such a lamp burning petrol can be obtained in several sizes. A small petrol blow-lamp of half-pint capacity burns for about one and a quarter hours, while a larger one holds a pint, which is sufficient to burn two hours either continuously or in short periods.

The lamp consists of a container holding the liquid, upon which is mounted a bunsen burner and a regulating valve.

To operate the lamp, first unscrew the filler cap, nearly fill the container, and replace the cap. Then partially fill the recess at the top of the container with methylated spirit and ignite it, taking care to see that the adjusting valve is closed; that is, the valve knob cannot be screwed up any farther when rotated in a clockwise direction. Just before the methylated spirit burns out, unscrew the valve a trifle. The vapourised petrol will ignite and burn with a bluish flame. If a long white flame appears it indicates that the burner is not sufficiently hot and the process of reheating must be repeated. When the burner has got sufficiently hot, the air-regulating sleeve should be adjusted to take the maximum amount of air.

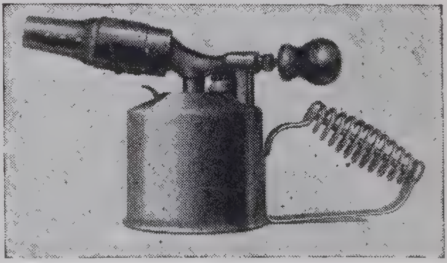


Fig. 1

The paraffin blow lamp is somewhat different from the petrol-fed lamp owing

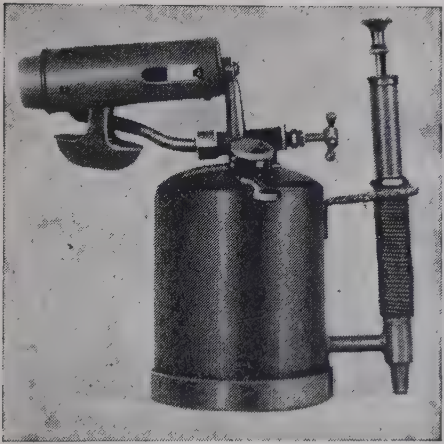


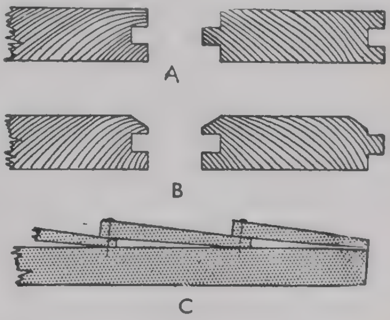
Fig. 2

to the fact that paraffin is so much less volatile than petrol. This necessitates the use of an air pump to force the oil round the coiled pipe within the burner which, when heated by the flame, volatilises the oil and forms gas which issues from the jet. The filler cap is provided with a screw-operated valve which, when opened, reduces the pressure within the container. From this it will be seen that the amount of heat is regulated by the pump and valve. If the heat is too intense, the valve can be opened a trifle to reduce the pressure. On the other hand, if greater heat is needed, a few strokes of the pump will give the desired effect. An illustration showing a paraffin blow-lamp appears in Fig. 2.

To enable a blow-lamp to work efficiently, the minute hole in the nipple must be kept scrupulously clean. For this purpose a piece of thin steel wire fixed in a holder, called a pricker, is usually included with the lamp.

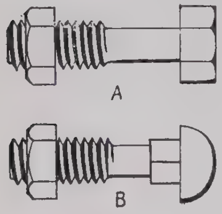
Boards.—The term board is generally applied to sizes of wood less than 2 in. thick and of any width. The usual stock thicknesses are $\frac{5}{8}$, $\frac{3}{4}$, 1, $1\frac{1}{4}$ and $1\frac{1}{2}$ ins., while the widths are 6, 7, 8, 9 and 11 in. Boards can be obtained in any length from about 8 ft. to 24 ft., either sawn or prepared, with plain edges. Floorboards are to be procured with either plain or tongued and grooved edges as represented at A in the figure. Matched boards B, sometimes called matching, are provided with tongued and grooved edges and are useful for cladding sheds and making partitions, while weatherboards, as indicated at C, are used for outside work, principally in shed construction.

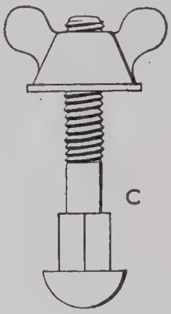
Bolts and Nuts.—Bolts and nuts are useful to the woodworker as well as the metalworker and form a convenient means of fastening which allows the parts joined to be taken apart. The bolt and nut shown at A in Fig. 1 is the type of steel bolt with a hexagonal head, used by engineers, and provided with a standard Whitworth thread. That shown at B is the type frequently used by woodworkers. It will be seen that the bolt is provided with a square shoulder immediately below the rounded head and that the nut is of square section. The shoulder prevents the bolt from turning in the work when tightening up the nut. In using a bolt for fastening wood, it is important that a fairly large washer be placed under the head as well as between the nut and the wood, to prevent both bolt head and nut from being pulled into the work when tightened.

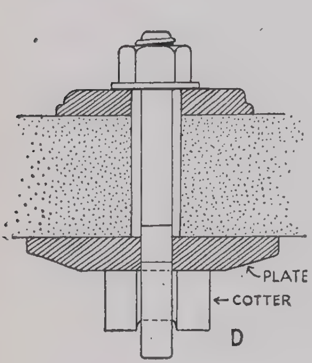


Boards

Bolts provided with wing nuts, such as that shown at C, come in handy for many purposes where great pressure is not required between the parts to be joined. The use of a spanner is unnecessary with this type of nut as the wing shape enables it to be screwed up or unscrewed by the fingers.







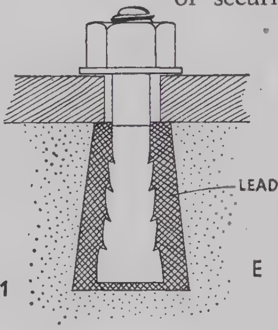


Fig. 1

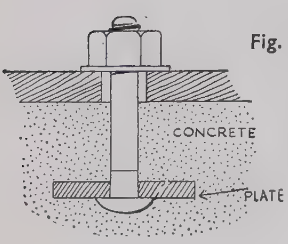


Fig. 2

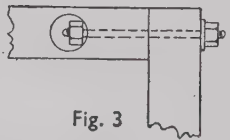


Fig. 3

The bolt illustrated at D is useful for holding down engines, electric motors, and other comparatively heavy machines on a concrete foundation. The lower end of the bolt has a rectangular hole through which a cotter passes. This keeps the bottom plate in position and prevents the bolt revolving when the nut is loosened or tightened.

The rag bolt E is also a useful type of bolt for holding down purposes in stonework. The jagged holding portion of its body is tapered, and the hole into which it fits is filled with molten lead.

Rag bolts can be effectively used in concrete, the hole being filled with liquid portland cement.

When ordinary round-headed, square-shouldered bolts are to be fitted in concrete—as, for instance, for holding down the bottom sills or plates of a portable shed—it is necessary to fit a large iron plate with a square hole to fit the shoulder of the bolt to prevent it revolving. Fig. 2 shows the method, while Fig. 3 shows a useful method of securing a horizontal and vertical member of a frame.

Boxwood.—An exceedingly hard wood of yellowish colour and has a very close, even grain. Takes a good polish, and is used principally by the wood turner for making small ornamental articles.

Brackets.—Brackets are useful for a great variety of purposes. That shown in Fig. 1 can be constructed of planed batten 2½ in. wide and 1 in. thick and is useful for supporting fairly wide shelves. Suitable dimensions for a shelf 15 in. wide would be as follows: Length of A, 12 in.; that of B, 16 in.; and C, 15 in. The parts should be screwed together in preference to nailing as the former makes a stronger job. The ends of the diagonal support should be cut to form a sharp angle and let into recesses made in the top batten and back plate.

A solid wooden bracket suitable for light shelves and having a back board is shown at B in Fig 2. Such brackets should be so arranged that the grain of the wood comes at the top, as indicated by the arrows. The brackets are kept in position by screws driven through the board above and by screws passing through the back board.

A bracket of more artistic design and suitable for supporting a plate-glass shelf in a bathroom is illustrated at C in Fig. 3. The top is cut out as shown to prevent the shelf slipping forward. An alternative to this arrangement is to use a small piece of sheet brass $\frac{1}{16}$ in. thick, as wide as the thickness of the shelf and of a length equal to the front vertical edge plus the thickness of the glass. Two small holes to clear the shanks of ½ in. No. 4 round-headed brass screws should be drilled in the plate. The latter can then be screwed into position. The brackets should be well glass-papered and enamelled white. The arrangement is shown at D in Fig. 3.

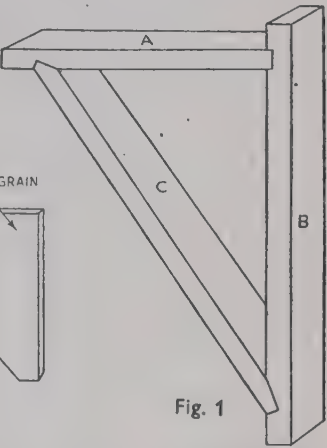


Fig. 1

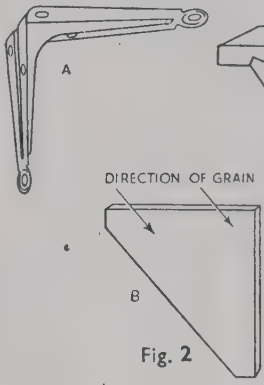


Fig. 2

Fig. 2 at A shows a patent stamped metal bracket for supporting shelves. This bracket is exceptionally strong and the peculiar formation of the stamping does away with a diagonal supporting piece. They are also very cheap and, being japanned, do not rust easily.

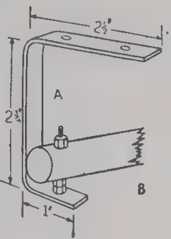


Fig. 4

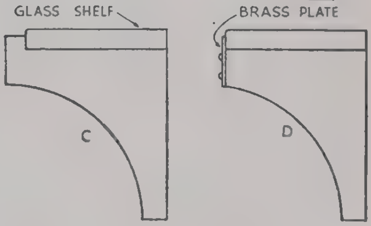
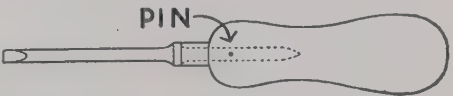


Fig. 3

Brackets for supporting a pelmet board and fixing curtain rods can be made at B in Fig. 4. The part A consists of a piece of iron or brass, preferably the latter, ½ in. wide, ⅛ in. thick and 6¼ in. long, bent to form two right angles, and drilled to take wood screws. The lower projection is also drilled to take either a 1 in. No. 4 B.A. brass round-headed screw or a ⅛ in. Whitworth. The screw is passed through the hole and locked in position with a nut and forms a projection or peg over which the drilled end of the curtain rod fits, the rod being kept in position by the nut on the top of the peg.

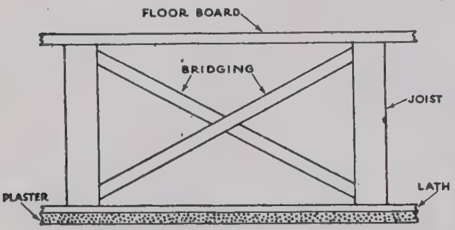
Bradawl.—A small but useful wood-working tool used for boring small holes. In bradawls of good quality a pin is inserted in the tang-end which fits into the handle, as illustrated in the figure. This feature prevents the handle and the blade coming adrift in use as usually happens with cheap bradawls. The blade is wedge shaped, and for good cutting it must be very keen. To use the bradawl press it into



Bradawl

the wood, blade across the grain to prevent splitting, giving the handle a slight twisting movement, and withdraw it in a similar manner. Give the cutting edge an occasional rub on the side of an oilstone to keep it in working condition.

Brass.—An extremely useful alloy from the practical man's point of view. Brass is easy to turn, file, screw and solder, and is comparatively soft and ductile. It can be obtained in bars, sheet, tubes and in various angular sections. Brass consists of zinc and copper, the ordinary quality containing about 65 copper and 35 zinc.



Bridging

Bridging.—Short lengths of wood about $1\frac{1}{2} \times 1\frac{1}{2}$ in. fixed crosswise between floor joists in the manner shown in the figure to keep them at the proper distance apart and to prevent them twisting, thus ensuring a rigid floor and a good ceiling below. In an endeavour to get work done quickly and without trouble, unthinking gasfitters, plumbers and electricians sometimes remove the bridging, thus defeating the object for which it is intended.

Bronze.—Ordinary bronze or gun-metal is an alloy principally used for bearings of machines. It is of a reddish colour and consists of nine parts copper and one part tin. Phosphor bronze is also used for bearings and its tensile strength is greater than gunmetal. It is composed of bronze with an addition of 2 per cent. to 4 per cent. of phosphorus.

Manganese bronze is about as tough and strong as mild steel and can be forged and rolled. It resists the erosion of sea water and is therefore used extensively for ships' propellers. Manganese bronze is composed of ordinary bronze and ferro-manganese.

Brace and Bits.—One of the most important tools in woodwork, used principally for boring. The brace is the device for holding and driving the bits which do the work. The woodworker has the choice of two types, namely, the plain and the ratchet. The former is rapidly becoming obsolete and is being superseded by the latter. By means of a ratchet device, the crank can operate either in a clockwise or anti-clockwise direction, in one circular sweep or part of a sweep. This consideration makes it particularly useful for work in awkward situations such as

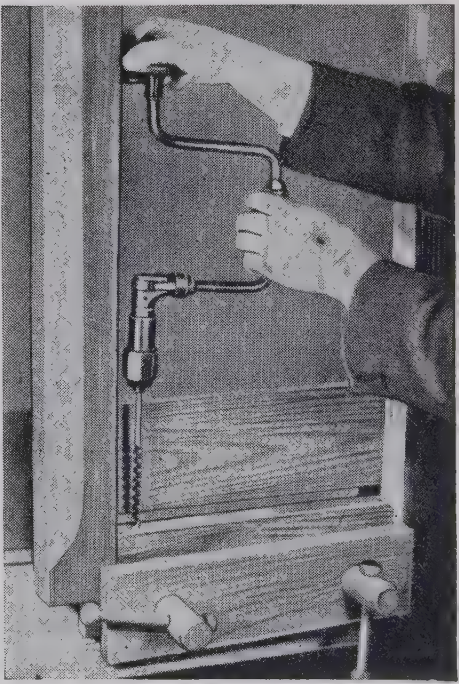


Fig. 1

in corners as shown in Fig. 1, where a plain brace could not be operated.

A brace having a sweep of 8 in. is a handy size to have, and one fitted with ball bearings is better than one with plain ones. An occasional spot of oil on the screwed portion of the chuck, the ratchet and the top bearing will keep the tool in good condition.

The types of bit most used by the woodworker are those for forming shallow holes and those for making deep ones. The former are known as centre-bits, shown at A in Fig. 2 and the latter twist-bits, illustrated at B.

The cutting end of a centre-bit has the following parts. The centre consists of a three-sided prong and is called the centre-pin, as this enters the wood first and forms a centre round which the outside nicker revolves and severs the fibres of the wood, while the cutter follows the action of the nicker and removes the waste core of wood. The other end of the bit has a square tapered shank to enable it to be held in the jaw-chuck of the brace.

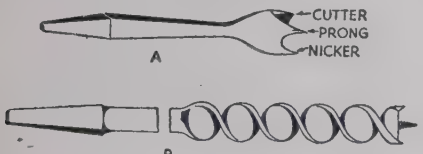


Fig. 2

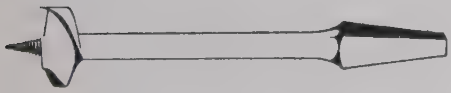


Fig. 3

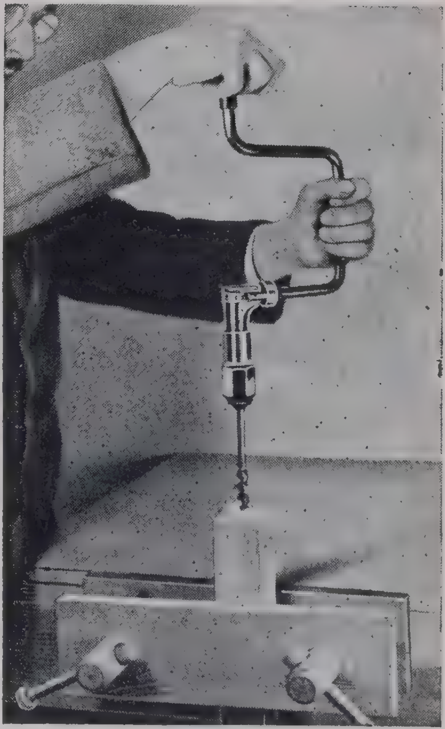


Fig. 4

In boring a hole in a board with a centre-bit, it is important that the operation be stopped as soon as the point appears at the other side, and then to finish the hole from that side. If boring is continued right through in one operation the bit will tear the fibres at the bottom and produce an imperfect hole.

It is useless to attempt to bore a hole in the end grain of wood with a centre-bit. Firstly, the point will follow the direction of the grain; secondly, the nicker will be working parallel with the fibres of the wood instead of at right-angles to them and, lastly, the cutter will be cutting at right-angles to the fibres instead of parallel to them.

The proper bit for boring wood in the end grain is a Gedge's pattern twist-bit which has a curved cutter. Even this tool, with its gimlet point, will sometimes tend to follow the grain. Fig. 4 shows the process of boring wood in the end grain.

Fig. 3 shows a screw-nose centre-bit which is taking the place of ordinary centre-bits, except for making holes in very thin wood.

Such a bit cuts very quickly, does not require pressure by virtue of the screw end and leaves a very clean hole true to size. Its disadvantage is that if used near the end of a piece of wood the screw point is likely to split it.

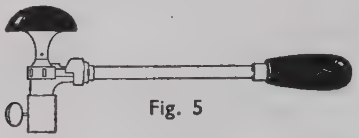


Fig. 5

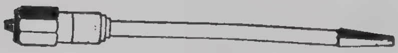


Fig. 6

For boring long holes, the standard length twist-bit is the correct tool to use. These bits, like the screw-nose centre-bits previously mentioned, draw themselves into the wood and the helical body brings the waste material to the top of the hole. It is advisable, however, in boring deep holes, to draw the bit out from time to time as the hole sometimes get choked, which retards cutting.

Twist-bits about half the length of the standard type are to be obtained. Such bits are particularly useful for boring holes for dowels.

The illustration appearing at Fig. 5 is a special form of ratchet-brace for corners, while that pictured in Fig. 6 represents an extension bit-holder, useful for many awkward boring jobs.

The chief thing to observe in boring wood is to keep the tool upright. This applies especially to twist-bits. A try square set up against the work is a useful aid in this direction, which can be dispensed with after a little practice.

To sharpen a centre-bit, proceed as follows: If the corners of the prong are rounded and the point blunt treat it with a small smooth file, holding the shank of the tool in the vice. Be careful not to remove too much metal, otherwise the point will be level with or even below the level of the nicker and this condemns the tool to the scrap heap. If the nicker needs attention, file it from the inside and not the outside, and if the top edge requires touching up, avoid altering the clearance angle. Take care to see that the cutting edge of the nicker does not come below the level of the outer edge of the inclined waste-cutter. Treat the inclined cutter with a smooth flat file, lifting the file after each successive cut, working from the front of the cutter. As this operation cannot be conveniently done with the tool supported in the vice, hold the shank at an angle, with the prong and nicker resting on the bench. Any wire edges remaining after treatment with a file should be removed by means of an oilstone.

Treat the cutting edges of twist-bits from the inside as any interference with the outside will reduce its cutting diameter. Note carefully how the cutting edge is formed and use either a rat-tail file or a flat file as the case may be.

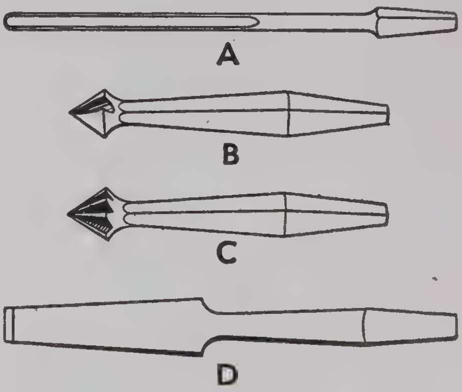


Fig. 7

A shell bit shown at A in Fig. 7 is used principally for boring screw holes, while the countersink-bit B, called a snail-horn, and the rose bit C, which can be used either for wood or metal, are for recessing the tops of holes in wood to allow the heads of screws to be either flush or below the surface. The screwdriver-bit represented at D is for driving in or withdrawing large screws where a powerful leverage is required.

Burning Off.—Burning off is a process for removing old paint. A petrol blow-lamp and scraper is necessary. The blow-lamp is held in the left hand and the flame played on the paint, which is softened. The scraper, held at an angle in the right hand, should follow the flame and with an up and down scraping movement.

The chief points to observe when burning off are not to allow the flame to become too intense and not to keep it in one spot too long, otherwise it is liable to scorch the woodwork. Only a small area should be treated at a time.

Butt-joints.—A butt-joint is often required in woodwork for joining narrow boards together to obtain the required width, and joining parts of framework, etc. The glued butt-joint shown at A in Fig. 1 is a common method of joining boards for obtaining width. To make a satisfactory joint of this type, proceed as follows: True up the top and bottom of the boards to be joined so that they are flat and out of winding as tested by winding strips and a straight-edge, and carefully plane the long edges so that they are quite parallel and square. Place one board in the vice and apply very hot glue to the edges to be joined in both boards. Then rub the edges together in a longitudinal direction to squeeze out as much glue as possible. Carefully remove the work from the vice and place them long edge upwards against a support and leave for at least twenty-four hours to enable the glue to harden. Fig. 2 shows the process of rubbing out glue from between the edges of two long boards, with the aid of a helper.

Another method is by means of dowels or wooden pins which are spaced at intervals along the edges to be joined as illustrated at B in Fig. 1. This joint is much stronger than the plain glued butt-joint. Before the holes can be bored the positions must be marked out accurately. After having planed up the faces and edges, place the two boards in the vice and accurately mark them together with the aid of a square and pencil as represented at Fig. 3, C, then bore the holes. For boards ½ in. thick, use ¼ in. diametered dowels; for ¾ in. and 1 in. wood, ⅜ in. diameter pins are required.

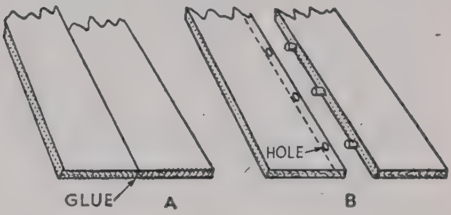


Fig. 1

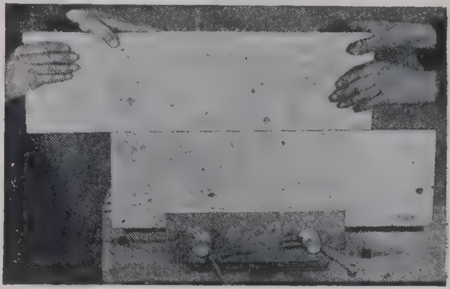


Fig. 2

The holes should be 1 in. deep and bored with a sharp twist-bit. Hold the brace perfectly upright and square and remove the sharp edges from the top of each hole.

The dowels are made from prepared rods obtained from most hardwood stores. Cut them to length, round the ends slightly and make a slot along the length of each one. The best way to make the slots is to fix the tenon saw, teeth upwards, in the vice and rub the pins along the teeth.

Apply hot glue to half the length of the pins and drive them carefully into the holes in one board. Then apply glue to the edges, the projecting parts of the pins and the edge of the other board and gently tap the top of the upper board until the joint is closed.

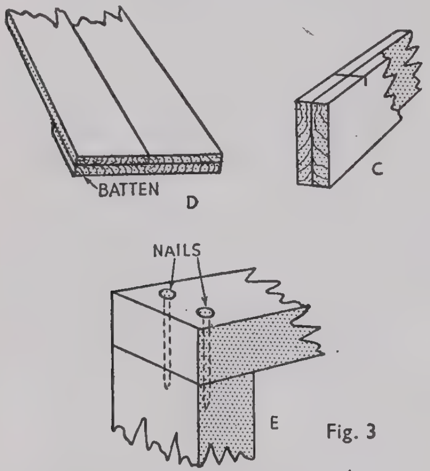


Fig. 3

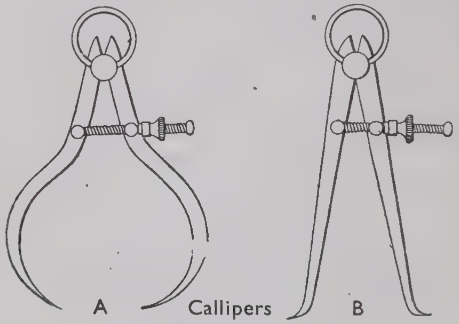
A simple form of butt-joint is shown at D in Fig. 3 where two boards are fastened together by a couple of battens. They should be planed and trimmed squarely at the ends, while the top can be smoothed with a plane after fixing. Fix them by driving in nails or screws from the underside.

The joint shown at E is a simple butt-joint for joining rough framework. The ends to be joined should be sawn perfectly square and to prevent splitting, the top piece should be drilled slightly smaller than the diameter of the nail.

Callipers.—Callipers are used principally for gauging the size of work turned in a lathe. There are several types of callipers, but the usual ones are those employed for measuring the diameters of external work such as bars and spindles, and known as external callipers. Internal callipers, as the name suggests, are used for gauging internal diameters of work.

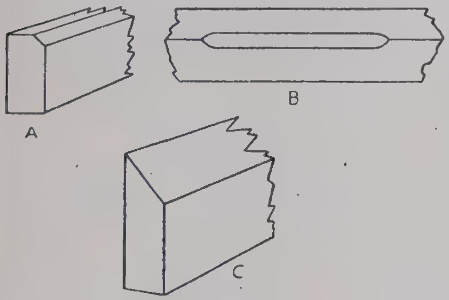
The most important point to observe when using these instruments is to allow the points only just to touch the work to be measured; if forced over a bar or into a hole in a bar inaccuracy will result due to the springiness of the tool. External and internal callipers are illustrated at A and B respectively in the illustration.

Cast Iron.—Cast iron is impure iron and has an appreciable amount of carbon in its composition. It is crystalline in texture, brittle and non-ductile, strong in compression, but weak in tension and is useless for objects subject to bending. Cast iron is usually cast into various shapes in moulds and is largely used for supporting columns, beds for machinery and objects subject to compression. There are two common kinds of cast iron—white and grey. The former is smooth and white, while the latter is comparatively rough and soft which renders it easy to work. If small castings are required, it is advisable to get them made in the grey variety.



Callipers

Cellulose Lacquer.—An excellent finishing medium similar to enamel for wooden and metal articles. The basic ingredient is cellulose and can be obtained in a large variety of colours at most oil and colour merchants. It is quick drying and produces a hard glossy surface. Two kinds of cellulose lacquer are made under various trade names, one for application with a brush and the other for spraying on. It is thinned by means of a special medium sold for the purpose. Turpentine and linseed oil cannot be used for thinning.



Chamfering

Chamfering.—Chamfering is the operation of forming a narrow flat face on the edge of wood to improve the appearance of the work, examples of which are illustrated at A and B in the figure. That shown at A represents a through chamfer, so called because the chamfer is carried through from one end of the work to the other. The example at B is a stopped chamfer and does not run through.

The through chamfer is carried out by first marking the desired distance from the face and side of the wood—equal distances giving an angle of 45 is the usual angle employed—and then formed by planing the edge down to the marked lines.

A stopped chamfer is marked out in a similar way, but as the cutting iron of a jack-plane cannot reach the end of the chamfer, a bull-nosed plane, having its cutting iron near the front of the tool, is the proper tool to use. If such a plane is not available, use a jack-plane and remove the remaining wood with a sharp chisel. The ends of a stopped chamfer should be gradually sloped off in the manner shown. A bevelled edge is illustrated at C.

Chisels, Wood and Metal Cutting.—Although there are three types of chisels used by the professional, the firmer chisel as shown at A in Fig. 1 will generally satisfy the needs of most amateur woodworkers, and five chisels with blades $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$ and $\frac{3}{4}$ in. wide will be found the most useful sizes to have. Those having hexagonal handles have the advantage of not rolling off the bench like chisels with round handles.

The chisel with its hardened steel wedge-shaped cutting end is used principally for removing waste from grooves in wood, making square holes or mortices in forming joints.

Chisels are useless unless kept very sharp, as blunt edges merely break the fibres of the wood instead of severing them. It should be noted that new chisels always require sharpening on an oilstone before being put into service as they leave the works only roughly finished on a grindstone.

The illustration appearing at B in Fig. 1 shows how a chisel should be sharpened. Note the difference between that indicated at X which shows the cutting edge of a chisel as bought and that at Y which illustrates an additional bevelled cutting edge produced after it has been treated on an oilstone. This small bevelled cutting edge must not be made too acute, otherwise the edge will be weakened. It is a good plan to get into the habit of rubbing down the main bevel every time the cutting edge

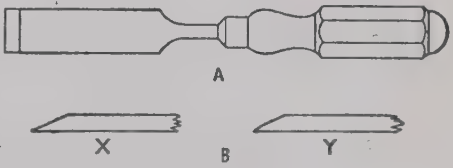


Fig. 1

is sharpened. If this is done it will prevent the angle of the bevel becoming too obtuse or thick. The angle of the bevel should be 30 degrees as shown.

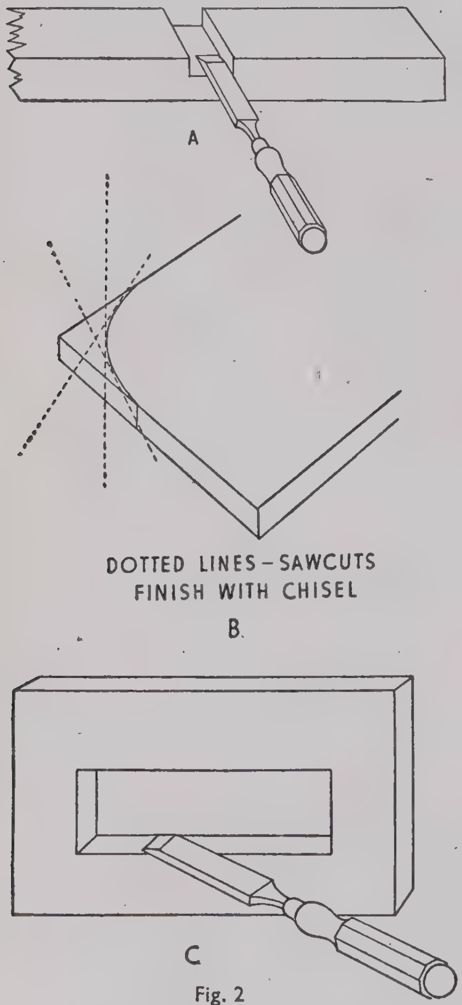


Fig. 2

Small chisels are best sharpened on the long edge of an oilstone.

At A, B and C in Fig. 2 are shown three practical applications of the wood chisel. That represented at A shows how a chisel is held in removing the waste from a channel, B illustrates the operation of trimming off the corner of a piece of work where the use of a plane would be impossible.

On no account should a hammer be used upon the handle when it is necessary to strike the tool. The proper implement to use is a hardwood mallet. A hammer ruins the handle and the roughness produced makes it unpleasant to work with when used as a hand-operated tool.

Circuits, Electrical.—Electrical circuits, so far as the handyman is concerned, are generally confined to those applicable to electric bells, light, heating and wireless. The circuits for electric bells have already been dealt with under the heading of Bells, Electric.

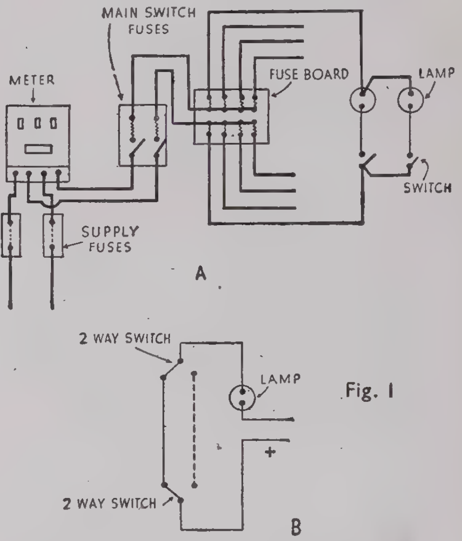


Fig. 1

The circuit shown diagrammatically at A in Fig. 1 shows how an ordinary house lighting circuit is arranged. Here, it will be observed that the main supply cable terminates in a sealed fuse-box which is usually fixed near to where the supply cable enters the premises. From this point the consumer's main cable, which is of a larger size than the sub-circuit wires as it has to carry the total current, enters the meter. From this point the wires connect the main switch and fuses which control the lighting system.

From the main switch the cable feeds on to a distribution fuse-board where sub-circuits, each carrying about eight lighting points, radiate to different parts of the building.

The diagram at B shows a common method of controlling two points, two two-way switches being necessary.

A typical power circuit for supplying electro radiation and other domestic electrical apparatus is illustrated at A in Fig. 2. Note that each plug forms a separate sub-circuit protected by fuses in the fuse-board. This method of connecting power plugs is compulsory. At B are seen the connections for an electric cooker, while that illustrated at C represents the connection for an immersion heater in the tank of a domestic hot water supply.

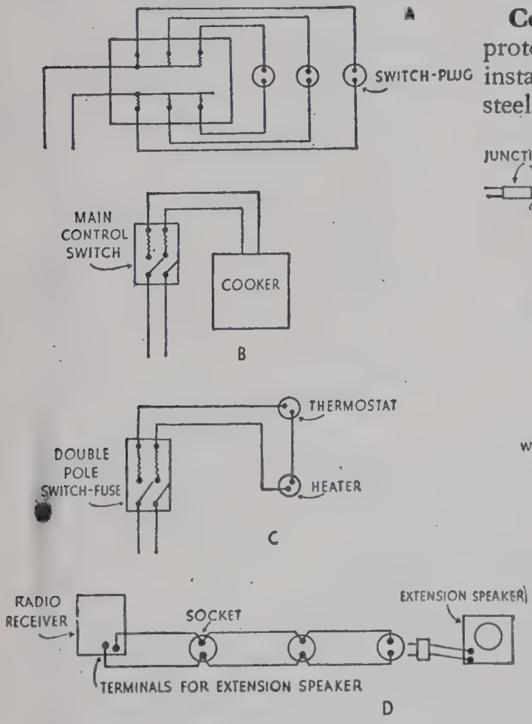
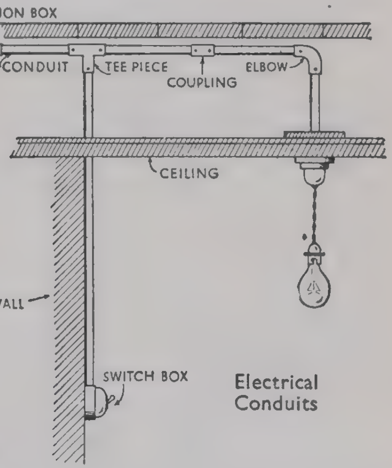

A
SWITCH-PLUG
MAIN CONTROL SWITCH
COOKER
B
THERMOSTAT
DOUBLE POLE SWITCH-FUSE
HEATER
C
RADIO RECEIVER
SOCKET
EXTENSION SPEAKER
TERMINALS FOR EXTENSION SPEAKER
D

Fig. 2

A common method for a wireless loud speaker is illustrated at D in Fig. 2.

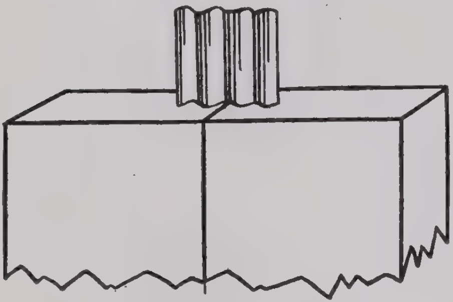
Copper.—Copper is a soft metal of reddish colour and extremely ductile. It can easily be hammered to shape when cold, and is an excellent conductor of heat, hence a copper kettle is to be preferred to a tinplate one. It is also an excellent conductor of electricity and for this reason it is used extensively for electrical apparatus of all kinds.

Conduits, Electrical.—In order to protect the wires of a domestic electrical installation from damage, enamelled steel tubes or conduits are generally employed. The tubes are used in conjunction with elbows, tee-pieces, connection and junction boxes as shown in the figure. There are several qualities of conduits. The cheapest kind has a close joint and is quite suitable for use in perfectly dry situations. The next quality is of the same gauge as the close joint variety, but has a brazed joint at the seam, while the best quality conduit is sufficiently thick to enable screw-threads to be cut at the ends to fit into screw-threaded fittings.


JUNCTION BOX
CONDUIT
TEE PIECE
COUPLING
ELBOW
CEILING
WALL
SWITCH BOX

Electrical Conduits

This kind of conduit is employed in the best classes of electrical installation work as it forms practically a watertight system and by virtue of the screwed junctions is continuous throughout and can therefore be properly earthed. Where conduits are exposed to the weather, heavy-gauge screwed, galvanised conduit should be used, as the zinc coating protects the steel pipe from rust.



Corrugated Fasteners

Concrete and Cement.—Concrete and cement are invaluable for making floors for garages, garden paths and garden ponds and a host of other purposes.

Concrete is made of a mixture of portland cement, aggregate, sand and clean water and a good mixture for general purposes is composed of one part cement, two parts sharp clean sand, and four parts aggregate which may consist of washed ballast, small pieces of broken brick or small stones. It is essential that the sand be free from dirt and other foreign matter as their presence greatly reduces the strength of the concrete.

The rough concrete surface is generally faced with a layer of cement and sand to give it a smooth face.

To estimate the amount of concrete for a given job, first find the cubic capacity of the part to be treated. For instance in making a path 54 ft. long, 3 ft. wide and 5 in. thick (that is 4 in. of concrete plus 1 in. facing of cement and sand), the amount of concrete required would be $54 \times 3 \times \frac{1}{3}$ ft. $= 54$ cu. ft. or 2 cu. yd. On the basis that 1 cu. yd. of a 1 : 2 : 4 : mixture requires 5 cwt. cement, 12 cu. ft. sand and 1 cu. yd. aggregate, it follows that $2 \times 5 = 10$ cwt. cement, $2 \times 12 = 24$ cu. ft. sand and $2 \times 1 = 2$ cu. yd. of aggregate will be required for the path.

Success in making concrete depends, to a very great extent, upon the mixing, which is first done in the dry state. This is done on a mixing board consisting of smooth boards held together at the back by battens, a handy size being about 4 ft. square. Procure a strong bucket and place 2 measures of sand in the centre of the board and add 1 measure of cement. Mix these together thoroughly with a spade or shovel and add 4 measures of aggregate. Turn the mixture over and over—the more times the better—until the whole is thoroughly incorporated. Then add from time to time as the mixing proceeds, sufficient water to form a plastic mass. Too much water will make the concrete sloppy and the aggregate will sink to the bottom when laid.

Corrugated Fasteners. — Short pieces of thin corrugated steel with sharp edges to enable them to be driven into wood in joining boards together (see diagram).

Corrugated Iron.—Corrugated galvanised iron is useful for covering sheds, garages and other structures and does not require boarding underneath as composition roofing materials do. Stock sizes run from 4 ft. to 10 ft. in length and from 2 ft. to 4 ft. wide. A useful size is 26 in. wide which covers 24 in. including a 2 in. overlap. In some cases it may be advisable to allow 4 in. overlap.

When used for roofing purposes, the sheets should overlap the ends 6 in. in their length, but, when used vertically, a lap of 3 in. will usually suffice.

Corrugated iron is obtainable in several thicknesses, No. 20 gauge being recommended where very strong work is required. For ordinary purposes, a No. 24 gauge will generally answer requirements.

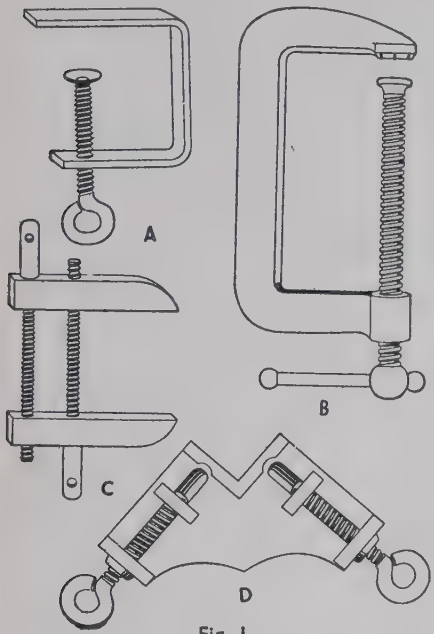


Fig. 1

Galvanised iron screws and washers are used for attaching the sheets to the framework, etc., and these should be driven in holes punched in the top of a ridge not in a valley.

Cramps.—There are many wood-working jobs that call for the use of a cramp in some form or other. The small, light cramp consisting of a piece of iron bent twice at right angles and provided with a screw as illustrated at A in Fig. 1 is a most useful type. When using such cramps it is advisable to interpose thin pieces of wood between the work and the cramp.

The cramp shown at B is for holding larger material, while that shown at C is a wooden cramp fitted with beech jaws and hornbeam screws.

Another useful type of cramp for cramped framework is represented at Fig. 2, where two are shown in position on a frame after having been glued.

These cramps consist of adjustable heads fitted to long hardwood members, preferably oak, drilled with a number of holes through which pegs pass and keep the heads in position. Cramp-heads of this description are good substitutes for the tradesman's all steel cramps which are, of course, much more expensive articles.

Fig. 3 shows a piece of work cramped up by means of a home-made cramp and wedges. Such a device is easily made with a piece of board about $\frac{3}{4}$ in. thick and 3 or 4 in. wide and two cross-battens screwed near the ends of the face, to the base.

The mitre cramps at D in Fig. 1 are useful for picture framing as they hold the moulding securely together whilst the nails are being driven in, and ensure the parts being put together squarely.

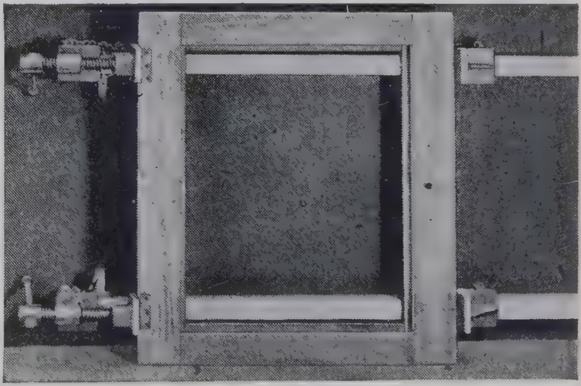


Fig. 2

Damp-course.—The damp-course,

or what might be better termed the damp-preventing course, of the walls of a house is one of the most important items in building construction and its inclusion is insisted upon by all local authorities.

It consists of a layer of slate or other water resisting material such as specially prepared bitumen felt, and is used as a prevention against moisture working up by capillary attraction from the foundations and rendering the walls damp. The course is always made above ground level, otherwise its object is defeated. For this reason it is imperative that flower beds, paths and soil, etc., be kept well below the level of the damp-course.

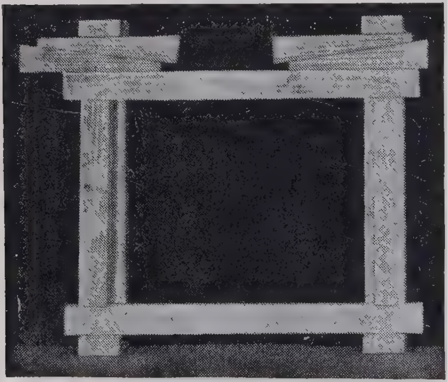


Fig. 3

A piece of slate or bitumen felt placed on the top of bricks, which are commonly used for supporting the floor joists of sheds and structures of a similar nature, will prevent moisture from the soil rising to the timber and prevent the timber from rotting.

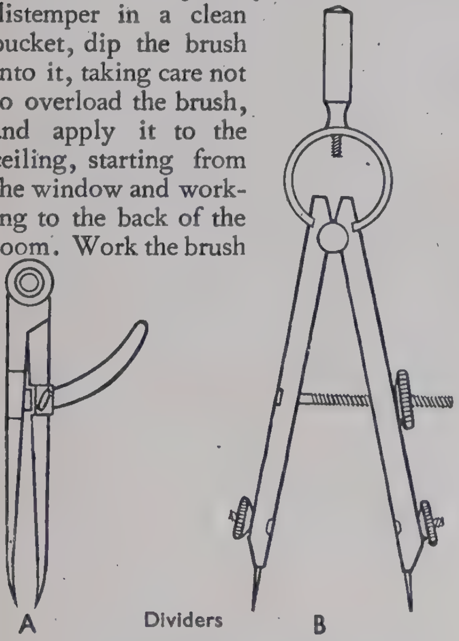
Deal.—Wood, obtained from the northern pine of the Baltic regions and elsewhere, most frequently used by the amateur. There are two kinds of deal, one known as yellow deal and the other called white deal. The former is used for all kinds of joinery work. It is easy to work and, in the best quality, has but few knots. The white variety, sometimes called spruce, as it is the product of the spruce fir, is unsuitable for joinery but is handy for making shelves and the like. It is rather difficult to plane owing to the presence of numerous hard knots.

Distempering.—Before distempering a ceiling clean off the old distemper, using an old brush, a sponge and clean warm water. Start at one end of the room, mount a pair of steps and rest the bucket on a high box or better still, stand on a trestle formed by a scaffold board supported between two pairs of household steps. Apply a small quantity of water to about a square yard of the ceiling to soften the old whitewash. Then go over it again, this time rubbing vigorously. Repeat the operation as often as necessary, rinsing the brush well after each application. Then clean off thoroughly with a damp sponge. Continue in this way until the whole of the ceiling is thoroughly clean. Next, remove any loose plaster remaining in cracks and fill with a mixture of plaster-of-paris or Keen's cement and water, not too sloppy, applying it with the point of a plasterer's trowel. Before stopping the cracks, wet them with a brush as plaster will not adhere to a dry surface.

When the ceiling is dry, give it a coat of size so as to fill the pores. A small packet of dry size mixed with warm water will be ample for a ceiling of average dimensions. Put it on with a distemper brush and take care not to miss any part, otherwise the ceiling will look patchy when finished.

As there are many excellent and inexpensive proprietary brands of distemper which only need the addition of water it is a waste of time to make it yourself. Some are supplied in paste form and others in powder, but, no matter what kind is chosen, follow the makers instructions as to the quantity of water required and the method of mixing. Allow 1 lb. for every 60 sq. ft. to be covered.

Put a small quantity of the mixed distemper in a clean bucket, dip the brush into it, taking care not to overload the brush, and apply it to the ceiling, starting from the window and working to the back of the room. Work the brush unhesitatingly in all directions and cover a small section at a time, joining the parts when wet.



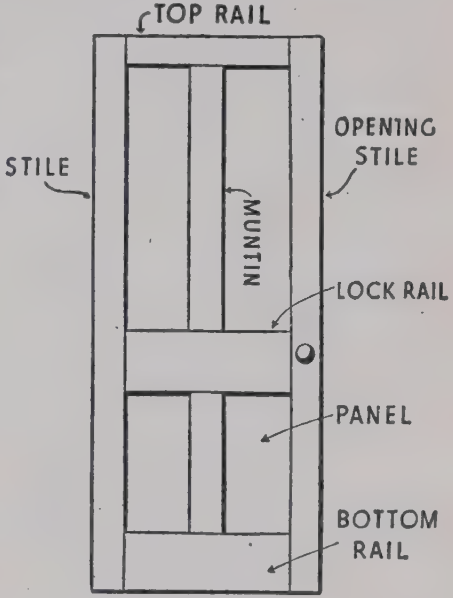
Dividers

In distempering walls of important rooms, an oil-bound washable water-paint should be used. Such a distemper can be applied successfully to wall paper provided that the paper is firmly attached to the wall. If the paper is dark and the pattern bold two coats should be given, allowing the first coat to dry thoroughly before applying the second. Remove all dust from the paper and if the paper is thick apply a coat of size. Start at the top of a convenient corner and work downwards in strips about 3 ft. wide, joining each strip when wet.

Dividers, Wood and Metal.—The diagram A shows a divider suitable for woodworkers. It is used principally for transferring measurements from the ruler to the work, drawing out equal distances on work and striking curves. The quadrant at the top of one leg and wing nut at the other enable the legs, after being set, to be locked.

Dividers suitable for metalworking are illustrated at B. The tool has a spring head and side adjusting screw by which accurate adjustment is obtained.

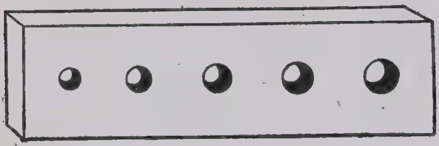
Doors.—There are numerous types of doors; the one shown in the diagram is one commonly used for rooms. Such a door is made up of components bearing different names as the illustration shows. The vertical pieces forming the sides are known as the stiles, the top and bottom horizontal components, the rails and the middle horizontal piece is termed the lock rail. The centre vertical portions are the muntins, while all these parts enclose the panels. The frame supporting the door is built up of the following parts: the two vertical sides are jambs and the top horizontal



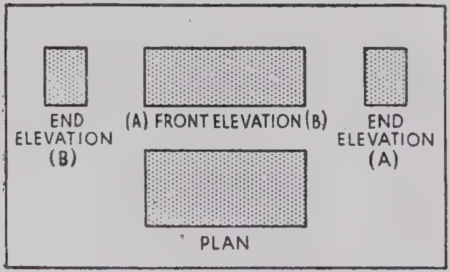
Doors

is the lintel or head. Narrow strips of wood fastened to these and preventing the door from swinging beyond its closed position are the door stops, and the finishing bead is termed the architrave. Constructional details are given in subsequent articles.

Dowels.—Dowels are short pieces of hardwood of round section. They are of inestimable value to the woodworker as a means of joining framework and boards together, and very often eliminate a more complicated joint. Dowels are formed from dowel rods which can be bought quite cheaply or they may be made by driving a length of roughly shaped hardwood through a dowel plate as illustrated above. Such a plate with $\frac{1}{4}$, $\frac{5}{16}$, $\frac{3}{8}$, $\frac{7}{16}$ and $\frac{1}{2}$ in. holes can be bought from most tool suppliers. When the dowel pins are glued they should be slotted along their length to allow surplus glue to escape from the holes into which they fit.



Dowels

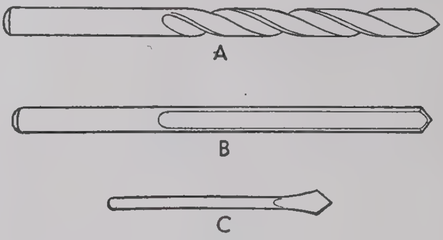


Working Drawings

Dowel rods make excellent curtain rods if enamelled, and they are useful in the construction of towel rails and other articles where strong, light, circular, wooden rods are required.

Drawings, Working.—Elaborate instruments are not necessary for amateur work. A plain drawing-board, consisting of a piece of $\frac{1}{2}$ in. plywood with battens at the back, tee square, 60 deg. and 45 deg. set square, a pair of combination compasses and dividers, a protractor for setting out angles and a set of cardboard scales, will generally answer requirements. The cost of such an outfit should not be excessive.

The usual procedure is to give three views of the object, with additional drawings of details. Thus it is possible to show the length, width and depth. In the diagram the top centre figure shows a front elevation or view, that on the right is a side elevation or view of the end A (front elevation) while the drawing on the left-hand side is a similar view of the end B. Immediately below the front elevation is the plan, or bird's-eye view, of the top. From this it will be seen that the front elevation gives the length and height, the end elevation the width and height and the plan the width and length.



Drills

Objects such as cigarette boxes may be drawn full size, but drawings of larger articles should be made to a scale such as 6 in. to the foot or half-full size, 3 in. to the foot or quarter-full size, 1 in. to the foot or $\frac{1}{12}$ full size and so on.

Drills.—For drilling clean holes in metal, except sheet stuff, twist-drills, varying from $\frac{1}{16}$ in. to $\frac{3}{8}$ in. in diameter, should be in every kit. Such drills, illustrated at A, above, can be used for drilling wood. This applies to boring holes for screws near the end of a piece of wood where a bradawl or gimlet might split it.

Twist-drills are often operated by a geared, hand-drill stock, the advantage of such a tool being that it can be operated in awkward places and the tool can be taken to the job whereas a drilling machine cannot.

The latter tool, however, is capable of producing holes absolutely at right angles to the face, a somewhat difficult operation where a hand-drill is employed.

For accurate work twist-drills must be sharp and, when in good condition, they will do their work with little pressure. On the other hand, a blunt drill rubs the metal instead of cutting it and, in the smaller sizes, abnormal pressure means a broken drill. As soon as a drill gets blunt, give it a rub on an oilstone, holding the tool at an angle and giving it a twisting motion. If this does not have the desired effect, the cutting edge should be re-ground on a grindstone and then finished on an oilstone.

Twist-drills are unsuitable for drilling thin metal as the cutting edge is likely to jam as it breaks through the hole. Fluted drills having parallel flutes as illustrated at B in the figure are the proper tools to use for this purpose, and the metal should be supported on a piece of wood to keep it flat.

Very small holes can be effectively drilled in sheet metal with diamond-pointed drills, worked with an Archimedian drill-stock.

However, it should be noted that these drills are not at all suitable for work of a heavier character.

When drilling large holes in metal, it is advisable first to drill a small pilot hole and then to proceed with a larger drill.

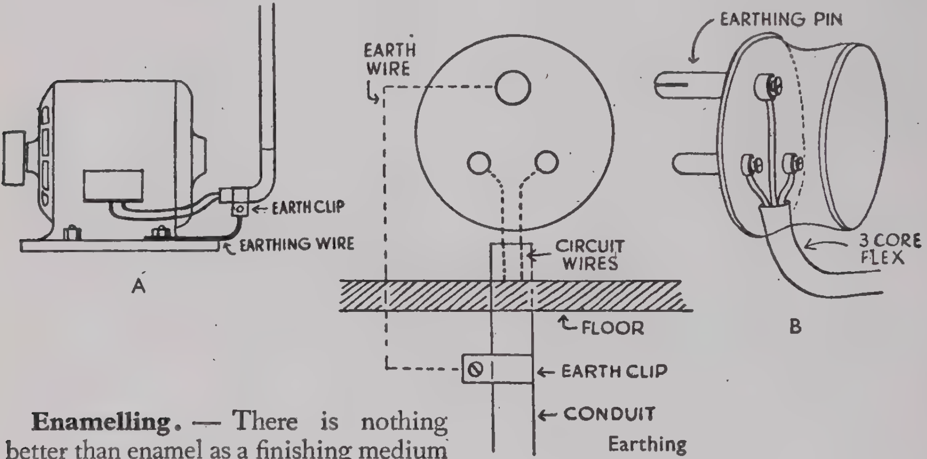
Dry Rot.—Dry rot is the result of the spores of a fungoid growth feeding on the substance of the wood. Its presence can usually be detected by a musty odour, and in some cases the wood has red and black streaks, while in others black and white spots appear on the surface. The timber is sometimes cracked and shrunken, and so soft that the blade of a penknife can be inserted with little effort. Dry rot generally occurs in the timbers of the ground floor of a building and usually can be traced to bad ventilation, damp, stagnant air being favourable to the growth of fungus.

If dry rot is present, it must be arrested without delay. The only satisfactory way of stopping the ravages is entirely to remove the woodwork and to treat supporting walls with a blow-lamp. New woodwork should be thoroughly treated with creosote before being installed, and it is of the utmost importance not to allow joists or boards to touch the walls. To prevent dry rot, see that the ventilating air-bricks which are spaced at intervals just below the ground-floor level in the outside walls are kept perfectly clear of leaves, dirt and other obstructions, and do not lay linoleum on a floor that shows dampness.

Earthing.—All electrical domestic appliances, whether permanent or portable, such as irons, cookers, washers, motors and garage lamps, should be efficiently earthed to prevent the danger of shocks, in case the device becomes alive through leakage or other defects. In the case of fixtures, this can easily be done by fitting a copper earth clip to the metallic sheathing or the conduit in which the conductors are enclosed, provided such protective material is continuous throughout and efficiently connected to earth, and connecting the conduit to the apparatus by means of either a bare or insulated copper wire of less than 7/22 S.W.G. wire. This method is represented at A in the figure.

Portable apparatus should be connected to the main wires through a 3 pin plug and socket and a three-core flexible lead as shown at B.

Elm.—A useful hardwood for use in damp situations and under water, but difficult to work owing to the presence of cross-grain. It is much used for the outside cladding of half-timbered buildings, barns, wheelbarrows and articles subjected to damp.



Earthing

Enamelling. — There is nothing better than enamel as a finishing medium for wood, for its hard, glass-like surface can be washed and washed again, provided a clean damp chamois leather be used, and the extra outlay of providing such a coat is money well spent.

As enamel is a finishing medium, two or more undercoats of flat oil paint should be given to the work, each being dried and lightly glass-papered before the next is applied. The last coat of paint must be approximately of the same colour as the enamel as the latter has very little body in it.

There are numerous proprietary brands of enamel supplied in various tints, and only the best should be used.

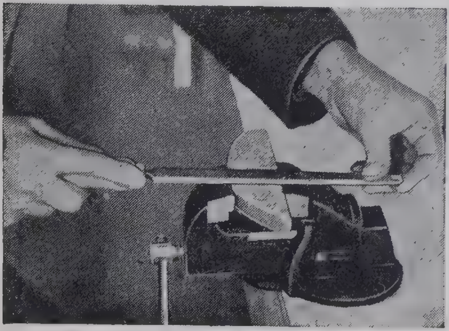
Enamel should be applied with a proper soft-bristled brush which should be clean and without dust. It should be flowed on and not laid and brushed as paint is applied. The temperature of the room should be at least 65 deg. F. to enable it to flow without drag. Dust, which is fatal to enamelling, must be excluded at all costs. Avoid putting on too much enamel, as this will probably result in the formation of blobs or "tears." On the other hand, too little enamel will cause the brush to drag and a satisfactory finish cannot be expected.

It sometimes happens that, although the room where the enamelling is being done is of the correct temperature, the enamel itself is cold and will not flow easily. When this happens, it is a good plan to put the container in a vessel of warm water.

Felt Roofing (Materials). — The old-fashioned tarred felt for covering boarded roofs is now rapidly becoming a thing of the past and flexible, inexpensive roofing materials, sold under various trade names, are taking its place.

There are two grades of such material, light and heavy, and it is usually supplied in rolls containing 108 sq. ft., 1 yd. wide and 12 yd. in length.

In fixing this material, start at the eaves or lower edge of the roof and lay the felt lengthways, allowing two or three inches at the ends and front for overlap. Fix the next piece so that the lower edge overlaps the top edge of the first strip by at least 2 in. The lower the pitch of the roof, the greater the overlap required. Use galvanised clout nails, as ordinary clouts will rust rapidly, and drive them in at intervals of about 2 to 3 in. The light-quality material can be cut with a pair of strong scissors, but the heavy grade requires a sharp pointed knife. Place the material on a flat surface and use a straight-edge for guiding the knife.



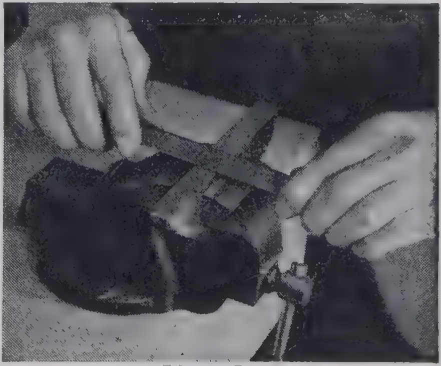
Filing—Fig. 1

Filing.—The process of filing accurately is acquired only with practice and does not consist merely of pushing the tool over the work and drawing it back again in a haphazard manner. Before attempting to use a file, see that you have got the proper tool for the job. Apart from the shape, which may be a hand or parallel, flat with bellied sides, square, round or half-round, the question of cut and coarseness of the cutting teeth is important. A single-cut file has parallel rows of teeth made at an angle across the face, and a double-cut file has extra rows crossing the others forming a series of cutting points.

For filing copper, brass, aluminium, lead and other soft metals, use a single-cut file. A double-cut file is for wrought iron, mild steel, hard steel (annealed). The degree of coarseness of the teeth will depend upon the nature of the work. In cases where a comparatively large amount of metal is to be removed, a coarse-toothed file can be used for taking off the majority, followed by a smooth file for finishing.

In filing wide metal, use the file obliquely and keep it perfectly flat. This is a difficult task, as the tendency is to produce a rounded surface. Hold the tool in the manner shown in Fig. 1 and push it gently forward to the end of the stroke, then relieve the pressure and draw the file back, continuing in this way and keeping the surface level and square along its entire length.

In taking the finishing cut it is usually advisable to drawfile the work. This is done by grasping the tool in both hands, placing it across and drawing it and pushing it back and forth the while along the work, standing in position at the head of the work as illustrated in Fig. 2.



Filing—Fig. 2

Never use a file without a handle and always use an old file for removing the scale on castings, for a new one will be ruined. Keep a piece of file card, consisting of fine steel wires on a cloth backing, for removing any metal that may clog the teeth.

Flashing.—A piece of metal, usually

lead but sometimes zinc, cut to a suitable shape for making a waterproof joint between angles in brick walls, etc.

Fig. 1 shows an illustration of a flashing suitable for covering the gap between a wall and the back plate of a lean-to conservatory, while that shown at Fig. 2 represents the side flashing between a roof and chimney stack. The ends are tucked in the joints of the brickwork, secured with lead wedges and pointed with cement.

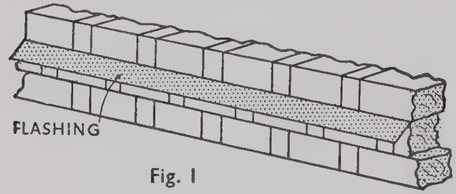


Fig. 1

Fretwork.—Fretwork is an interesting branch of light woodwork which fills the gap where circumstances do not permit heavier kinds of constructed woodwork.

Briefly stated, the process consists of tracing the outline of a design, made either on the wood itself or on a printed paper pattern stuck on the surface, with the aid of a small saw-blade held in a hand frame. Very little practice is needed before proficiency in fret-cutting is attained, and such articles as photo frames, artistic boxes, clock cases and many other ornamental and useful objects can be made with little effort.

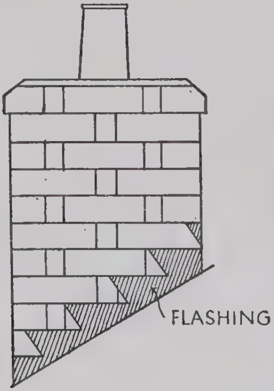
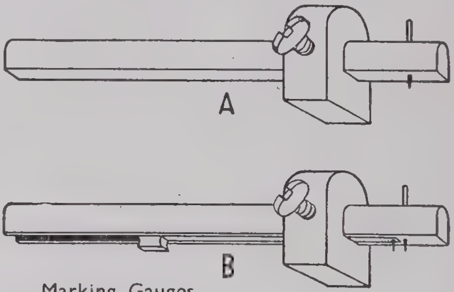


Fig. 2

Besides a hand frame, usually sold complete with a dozen saw-blades, a small Archimedian drill-stock with a few small diamond-pointed drills, a sawing table, glass-paper, tube glue and a supply of thin hardwood such as satin walnut, oak or mahogany, complete the outfit. Fretwork designs are to be obtained at numerous woodcraft shops.

Stick the pattern on with paste, not glue, taking care to smooth all wrinkles, and drill small holes in the interior part that has to be removed, to enable the saw blade to be threaded through. Support the work on the cutting table, which should be clamped to a corner of an ordinary table or other suitable flat surface, and start by cutting away the waste from the interior, using the saw in an upright position and giving it a gentle up and down motion. Then remove the exterior waste and glass-paper the surface to get rid of the pattern. The latter is better done by pinning the work down to a flat surface and applying fine glass-paper held on either a wood or cork block. Do not use water or the work will swell and the grain be raised. Any rough parts in the interior can be removed by a piece of glass-paper wrapped round a small stick or by a fine file. The parts can then be assembled and fixed with tube glue and left to harden.



Marking Gauges

Gauges, Marking.—A marking gauge is a simple yet important tool for the accurate marking of a line parallel to the edges of wood. As the illustration shows at A, the instrument consists of a hardwood bar or stock and an adjustable fence kept in position by a screw. At one end of the bar is a steel point which marks the wood when the tool is drawn along the surface.

A mortice gauge B, by which two parallel lines can be marked in one operation, is similar to the ordinary marking gauge but has an extra point which is adjustable. As its name suggests, it is used principally for marking out mortices and tenons and is used in the same way as the single-pointed tool.

Gimlets.—Gimlets are used for boring small holes in wood. They fulfil these requirements admirably, provided that such holes are not bored near the edges of the work, when there is great risk of splitting the wood. Gimlets are becoming obsolete and their place is being taken by the hand drill-stock and metal twist-drills, which not only obviate the risk of splitting the wood but cut a cleaner hole.

Glass-paper.—Glass-paper is a useful material for producing a perfectly smooth surface on wood, but it must not be used in a haphazard fashion or it is likely to spoil the work.

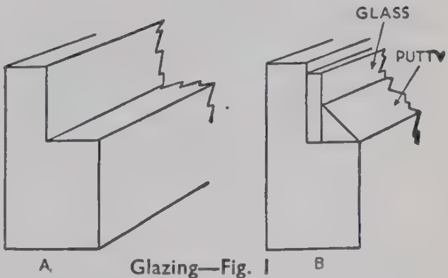
Glass-paper is to be obtained in several grades of coarseness, No. 2 being the coarsest, 1 a medium grade, while 0 is fine, and the one to use will naturally depend upon the work. If the surface left by the plane is rough, use the coarse grade followed by the medium and finish with the fine, while if the surface is comparatively smooth, omit the coarse and use the medium and fine.

In glass-papering a flat surface, never hold the material in the hand, as illustrated but employ a cork block and use it in the direction of the grain, otherwise deep scratches are likely to result which are difficult to obliterate. Concave and convex mouldings can be treated with glass-paper wrapped round a piece of wood shaped to correspond with the depression and projection of the moulding.

Glass-papering; incorrect method

Glazing.—Every handyman should acquire knowledge of the process of fitting glass, for he will find plenty of scope for exercising his ability in such instances as glazing a greenhouse, sashes, cabinet doors or picture frames.

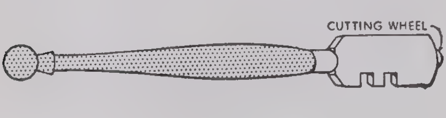
To explain the methods involved, it is assumed that a simple sash is to be fitted with glass. Such a sash is provided with a rebate or recess along one side of its inner edges as represented at A in Fig. 1 for supporting the glass on one side. On the other, the glass is held in position with putty, as indicated at B in Fig. 1.



Glazing—Fig. 1

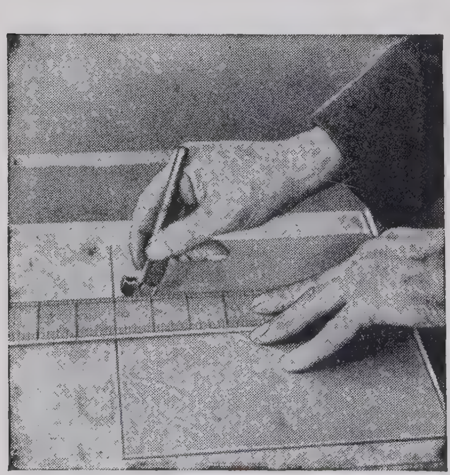
The first thing to do is to ascertain

the size of glass. To do this, measure the length and width of the rebate and deduct ⅛ in. from both dimensions, as the glass must not fit tightly otherwise it may crack while being fitted, or the wood may swell with the same result. It may be that you have an odd piece of glass which could be cut to the desired dimensions, in which case a glass cutter will be required. If such a piece of glass is not available, purchase the glass cut to size.



Glazing—Fig. 2

Glass is sold at so much per square foot and the thickness is represented by the number of ounces contained in a square foot. For instance, 16 oz. glass is thin and suitable for glazing light cabinets, while 22 oz. stuff is about ⅛ in. thick and is the thickness generally used for glazing window sashes.



Glazing—Fig. 3

If you decide to cut the glass yourself, get a good quality cutter with a hardened steel cutting wheel. The tradesman uses a glazier's diamond for cutting purposes, but these are expensive and, for occasional use, the wheel cutter will answer the purpose quite well. Fig. 2 shows such a tool.

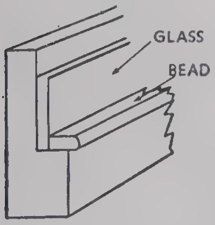
Clean the glass and place it on a perfectly flat surface. To enable the glass to be supported equally over its entire area a folded cloth should be interposed between the glass and the supporting surface, as any inequalities in the surface will probably cause the glass to crack when pressure is applied to the cutter.

Mark the desired dimensions on the glass and use a straight-edge for guiding the cutter. The tool is held between the forefinger and the second finger of the right hand and kept in a sloping position as shown in Fig. 3. Start at the top and gradually draw the cutter towards the bottom in one stroke. If the cutting has been successful, a clearly-defined scratch will be seen. A rough, uneven, more or less wide depression indicates bad cutting. Assuming that the cut is good, move the glass to the edge of the supporting surface so that the cut coincides with the edge. Hold the waste loosely with one hand and, with the tool, gently tap the underside of the unwanted piece near the cut, tapping from left to right. As this proceeds, the waste will break away, leaving a perfectly straight edge.

The next step consists of fixing the glass to the sash. Putty will not stick to bare wood as wood absorbs the oil. Paint the rebate with red lead paint and when dry apply a bed of putty in the recess for the glass to rest against. This is best done with the frame placed flat on a table. Place the glass in position and press it near the edges to exclude the surplus putty. Then drive one or two thin panel pins into the rebate to keep the glass in position. Work some putty into the remaining portion of the rebate and trim off the waste with a putty knife. Finally, level the puttied surface so that it forms a neat angle joint.

In glazing cabinet doors, the puttying operation is generally omitted. The glass is simply butted up to the shoulder of the rebate and kept in position by nailing on a narrow bead as indicated in Fig. 4.

Gluing.—Gluing is one of the most important processes in woodworking, and unless glue is made and applied in a proper manner, satisfactory results cannot be expected. For joining the parts of small work, liquid glue, sold in tubes, can be used; but in large work such glue is uneconomical unless purchased in tins.



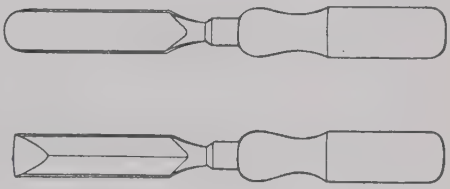
Glazing. Fig. 4

Many woodworkers, however, prefer to prepare their own glue. For ordinary glue, use only the best Scotch glue and, when purchasing it, see that it is hard, brittle and transparent. Prepare only sufficient glue for the job in hand as reheated glue loses its adhesive properties. Break a cake or part of a cake into fragments, place it in the inner container of a glue-pot having an inner and outer vessel, add clean cold water and allow to swell into a jelly. This will take twelve hours or more. Pour off the surplus water, fill the outer container with clean water and allow the glue to simmer gently for an hour or two, giving it an occasional stir. Then remove the scum which forms on the surface. The consistency should be that of thin treacle.

Use the glue very hot and apply it quickly with a good brush and, if necessary, heat the parts to be joined—chilled glue is useless—then rub the parts together to exclude as much glue as possible, and put the work aside for at least twenty-four hours in a dry place to allow the glue to harden.

The chief points to observe in gluing are that only a small quantity of glue is required to make a strong joint, that glue must be very hot and that large work should be cramped after gluing.

Gouges. — Gouges (see below) are really wood chisels provided with a circular cutting edge and are used for making circular-shaped grooves in wood. The cutting edge is either external-ground or internal-ground; that is, the bevel is formed at the end of the convex face of the tool or the concave portion. A gouge is used in very much the same way as a chisel and, in cutting a groove in a length of wood, is worked in the direction of the grain.

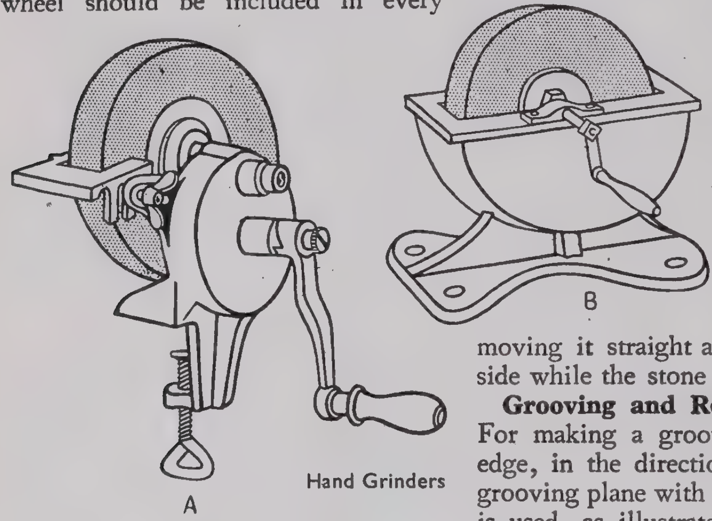


Gouges

Like chisels, gouges are useless unless very sharp. To sharpen an internal-ground tool use an oilstone slip either held edgeways in the bench vice or in the hand. An external-ground gouge is sharpened by rubbing it back and forth on a flat oilstone, holding the tool at an angle and giving it a twisting motion.

Graining.—Graining is a method of painting deal woodwork such as doors or window frames to imitate ash, maple and other better woods. Special tools in the shape of steel combs, each having teeth of different width, are drawn in zig-zag fashion along the finishing coat of paint, or graining coat, as it is called, before it is allowed to dry, and in this way producing the grain marks of the wood it is intended to imitate. When dry, the surface is usually given a coat of varnish. Graining requires exceptional skill and is rarely attempted by the amateur decorator. Owing to the time it takes, and the use of inexpensive, washable, hard-gloss paint, graining is rapidly becoming a thing of the past.

Grinding.—A suitable grinding wheel should be included in every handyman's kit, as it is invaluable for sharpening tools, knives, taking off small quantities of surplus metal and other useful purposes.



Hand Grinders

A hand-operated, geared, high-speed grinding machine for fixing to the bench as that shown at A in the figure can now be obtained quite cheaply while abrasive wheels such as emery and carborundum are to be procured in various degrees of coarseness.

For grinding edge-tools there is nothing better than the old-fashioned grindstone B, and the amateur woodworker will find that this machine is better adapted for grinding his tools than the high-speed emery type which is likely to draw the temper.

The grindstone should be used in a wet condition and it is better to allow the water to trickle on the surface from a container fitted with a tap to regulate the amount of water, than to rely on that drawn up from a trough. It is also advisable to draw off water from the trough when not in use as a partial wetness is detrimental to the life of the stone.

The stone should revolve towards the tool and not away from it, and if the surface becomes worn, it should be ground level. This can be done effectively by applying the end of a piece of gas piping near the edge and gradually moving it straight across from side to side while the stone is revolving.

Grooving and Rebating Wood.—For making a groove in the narrow edge, in the direction of the grain, a grooving plane with an adjustable fence is used, as illustrated at A in Fig. 1, page 39. Such a plane, with three steel cutters for making grooves, $\frac{1}{8}$, $\frac{3}{16}$ and $\frac{1}{4}$ in. respectively, is to be recommended and is the tool to have when grooving frames to take plywood panels. For preparing grooves at some distance from the edge of the face of a wide board, a plough plane is necessary as indicated at C, which illustrates a metal plough plane with three cutters of useful dimensions. In both cases planing is started from the farther end of the work and gradually worked back towards the near end.

In cutting grooves across the grain, a tenon saw is sometimes used for cutting down the sides to the required depth and the waste removed with a chisel, working the latter from one edge to the centre and then reversing the work,

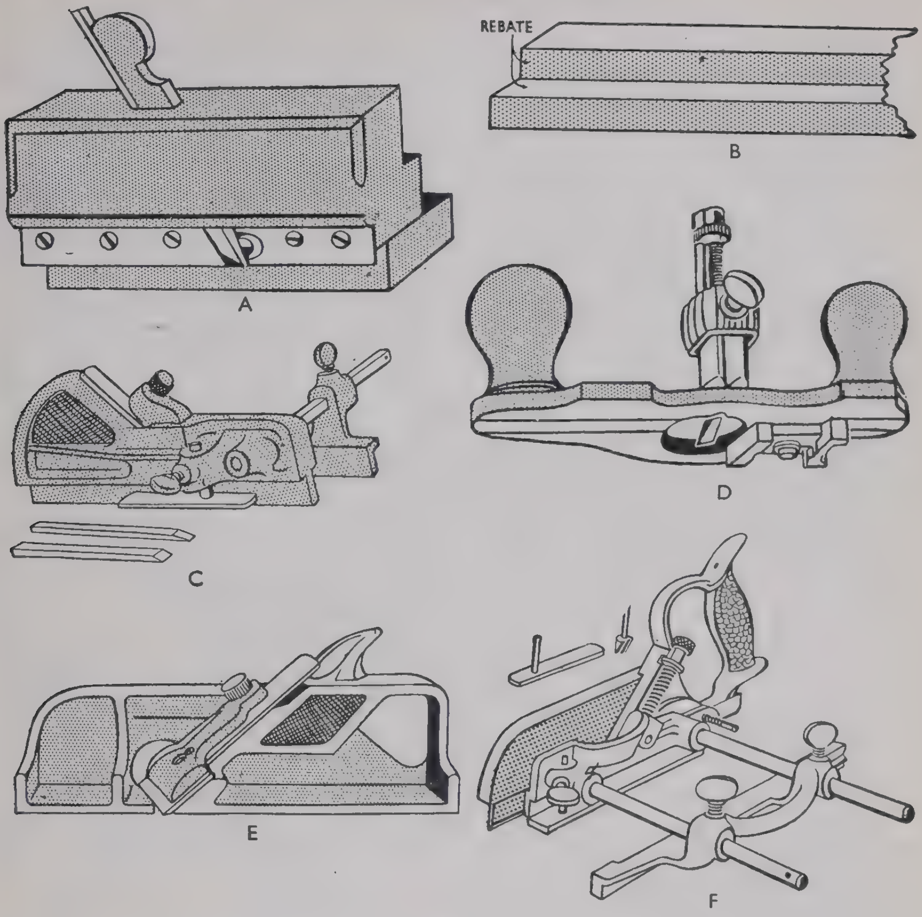


Fig. I

and repeating the operation. A better method would be to make the saw cuts and remove the waste with a router as illustrated at D.

Rebating is the term used when forming a recess in the edge of a piece of wood as illustrated at B. The usual method is to use a rebate plane as shown at E.

All these operations, except routing, can be done with a single plane known as an improved combination plane. This plane, represented at F in Fig. 1, is supplied with no fewer than seventeen tungsten steel cutters, and the amateur woodworker who takes his work seriously is advised to invest in one.

Fig. 2 shows a groove being formed by means of a combination plane.

Hacksaw.—The proper tool for sawing metal is the hacksaw. Such a saw is shown in action on page 40. The tool consists of an adjustable metal frame with suitable pegs at the top and bottom which fit into corresponding holes in the saw blades and hold it in position, while a wing nut at the top of the frame allows the tension of the blade to be adjusted. A handle at the lower end is provided for operating the tool.

In using the hacksaw, the blade should be inserted so that the teeth are away from the operator as the saw cuts only on the outward stroke. Fix the work securely in an engineer's vice, which should be rigidly attached to a strong bench to prevent vibration, and file a nick at the desired position in the metal. Hold the hacksaw as shown and start the cut at the nick which was made to prevent the blade from slipping during the first stroke. Keep the saw square to the work and apply a little pressure to the outward or cutting stroke only, then relieve the pressure and draw the blade back. Continue in this way until near the end of the cutting when the pressure must be almost entirely relieved.

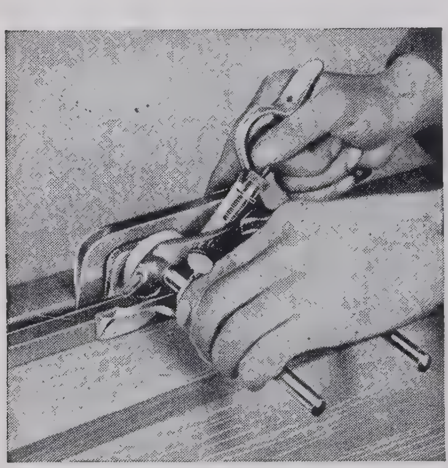
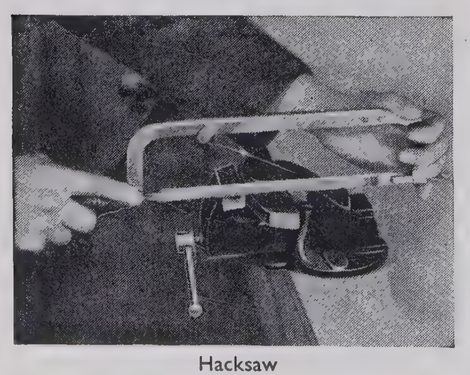


Fig. 2

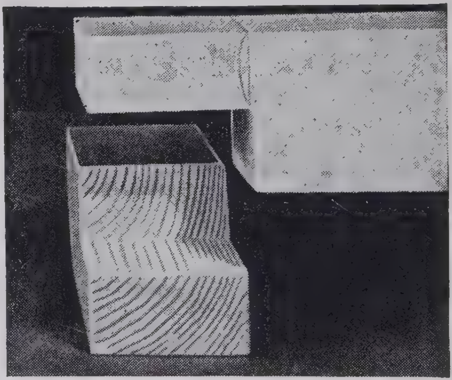


Hacksaw

If a finished piece of work has to be sawn, place a piece of sheet lead over each jaw of the vice before tightening up to prevent the work being marked.

For cutting mild steel, wrought iron and cast iron, use a blade having about twenty-four teeth, while for sawing brass and other soft metals a blade having eighteen teeth will give good results.

When sawing sheet metal edgeways, place the work between two pieces of hardwood in the vice and saw both wood and metal. Do not oil the saw.

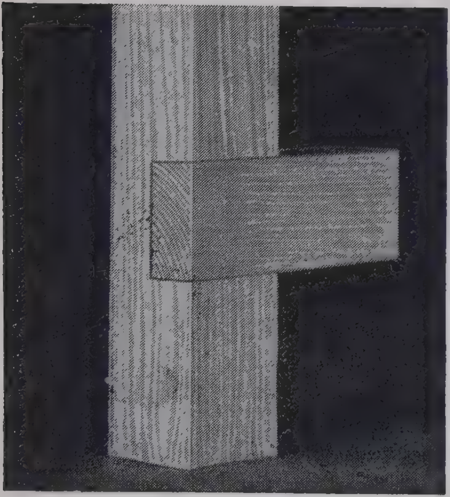


End Halved Joint

Halved Joints.—A simple joint illustrated above is known as an end halved joint.

In making the joint, a tenon saw is required for cutting the wood down to the proper depth and a chisel for removing the waste. Care should be taken when sawing to make the cut in the waste side of the guide lines and not to saw too deep. Another form of halved joint, known as the tee halved joint, is shown on page 41.

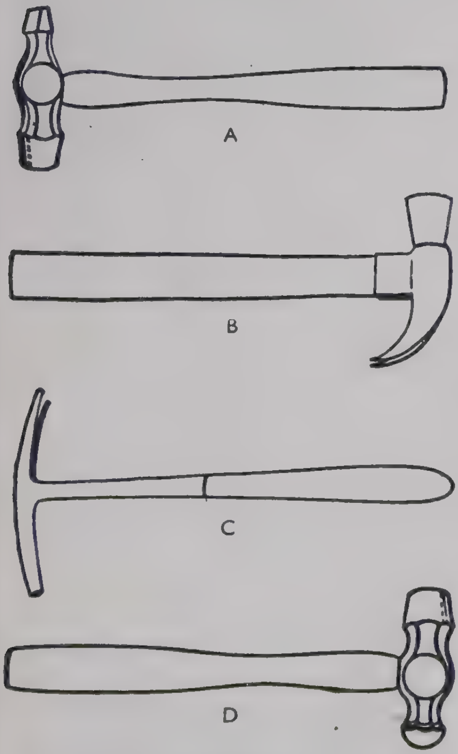
Hammers.—The woodworker's hammer, known as a Warrington hammer, is shown at A, in the figure, while a claw hammer B is also a handy implement for woodwork. The head



Tee Halved Joint

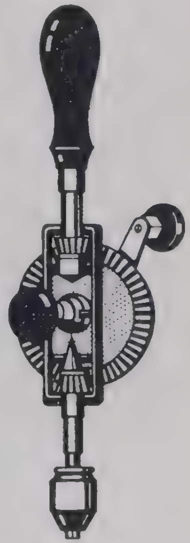
has a claw for withdrawing nails in addition to a striking face. The tool shown at C is an upholsterer's hammer used for driving in tacks. It is also useful for light cabinet work, for driving in panel pins and similar work. The essential difference between the engineer's hammer D and the others represented in the figure is the ball pane or the hemispherical reverse end of the head. This feature enables the ends of rivets to be hammered over.

In using these hammers, the blow should be imparted from the wrist and not from the whole of the arm as in using a sledge hammer, and, in driving nails, it is essential to reduce the power of the blows as the nail head approaches the surface of the work to prevent the hammer from bruising the wood.



Hammers

Hand Drill.—A tool for rotating drills and exceedingly useful in woodworking as well as metalworking. It consists essentially of a steel, adjustable chuck for holding the drills, driven at high speed by means of gear wheels as the illustration shows. The one shown will suffice for most amateur requirements, and will hold drills of all the usual sizes up to ¼ in. diameter.



Hand Drill

Hardening and Tempering Steel. The cutting edges of wood and metal-working tools sometimes need rehardening and tempering. The process of hardening is simple enough as the material only requires to be heated up to a bright red and then plunged into clean cold water. This treatment, however, renders the steel very hard and brittle; so brittle in fact that the tool

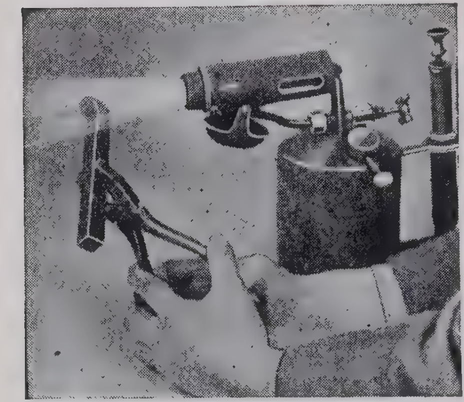


Fig. 1

would be of little use. To give the body of the tool toughness and strength and, at the same time, impart sufficient hardness to the cutting edge to prevent it becoming blunt, tempering is necessary. This reduces hardness and increases strength, and the amount of tempering depends on the particular tool.

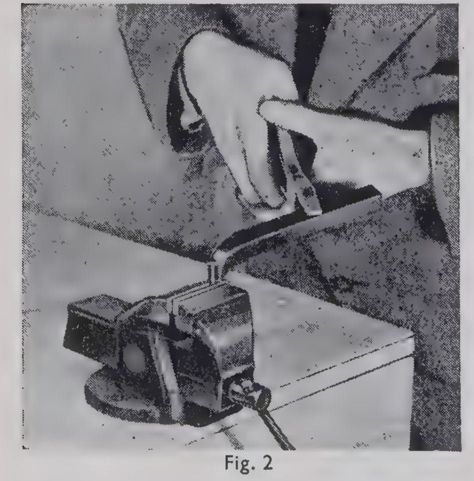


Fig. 2

When dealing with edge-tools, it is usual to combine hardening and tempering in one process. Thus, in dealing with a lathe tool, it is necessary only to heat up the nose as the body is already sufficiently tough.

To harden and temper such a tool proceed in the following way: Heat the nose, not directly upon the cutting edge or you may burn it, to a bright red, then plunge it vertically into clean cold water for a few seconds to make it dead hard. Rub the edge immediately with a piece of emery cloth to enable the changing colours to be observed as the heat turns from the body of the tool to the point. As soon as the surface assumes a light straw colour plunge it into cold water, keeping the tool swirling about until cold.

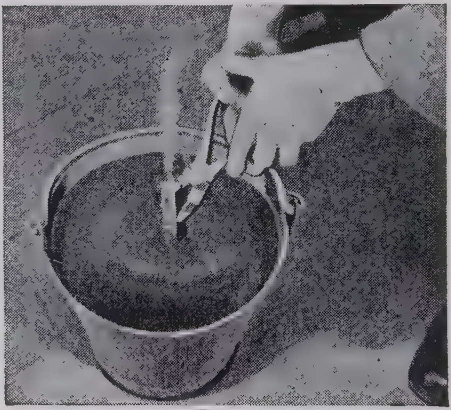


Fig. 3

Fig. 1 shows the nose of the tool being heated in the flame of a blowlamp, the operator is seen watching the colour-change in Fig. 2, while Fig. 3 illustrates the final quenching.

The following table will enable you to judge when to quench a particular tool:

Centre punches, scrapers, lathe tools	Light straw
Drills	Dark straw
Plane-irons, wood-cutting chisels, gouges, cold chisels, etc.	Brown
Knives	Light blue
Springs, screwdrivers ..	Dark blue

High speed steel requires special treatment and makers' instructions for tempering should always be followed.

Mild steel and wrought iron, which are comparatively soft metals, cannot be hardened by heating them up and plunging them into cold water, as cast or hard steel can, owing to the lack of sufficient carbon in their composition. These metals, however, can be case-hardened; that is, their surfaces can be rendered hard by heating the metal to a high degree of temperature and allowing it to absorb carbon. This treatment produces a hard-steel case or steel, hence the name case-hardening.

A common method of case-hardening is to enclose the work to be treated in a thick, iron, air-tight container, packed with either bone dust or scraps of leather and then heat it up to a cherry-red colour. The heat treatment is continued until the desired thickness of the case is obtained, four or five hours generally being necessary to produce a thickness of $\frac{1}{16}$ in. The glowing metal is swirled about and then removed from the container and plunged vertically into cold water, or, better still, cold water to which has been added a handful of salt. This hardens the outside case, leaving the interior soft. The kitchen fire may be used for case-hardening small articles.

In cases where only a thin hardened surface is required, the container method can be dispensed with and a prepared compound in powder form known as Kasenit can be applied to red-hot metal. The powder is sprinkled on the work and more is added from time to time as the compound melts. After about thirty minutes' treatment, which is generally sufficient for case-hardening small screws, the work is plunged into a bucket of cold salt water.

Hinges.—Fig. 1 shows a number of useful hinges designed for numerous woodworking purposes. That shown at A is an ordinary butt used for hinging heavy doors, while that represented at B is a loose butt which enables a door to be detached from its frame. A wide brass hinge suitable for attaching the desk board to a writing bureau is illustrated at C, and that at D is a long brass hinge as used for attaching the rising cover of a radiogram. A novel hinge in the shape of a bracket is shown at E.

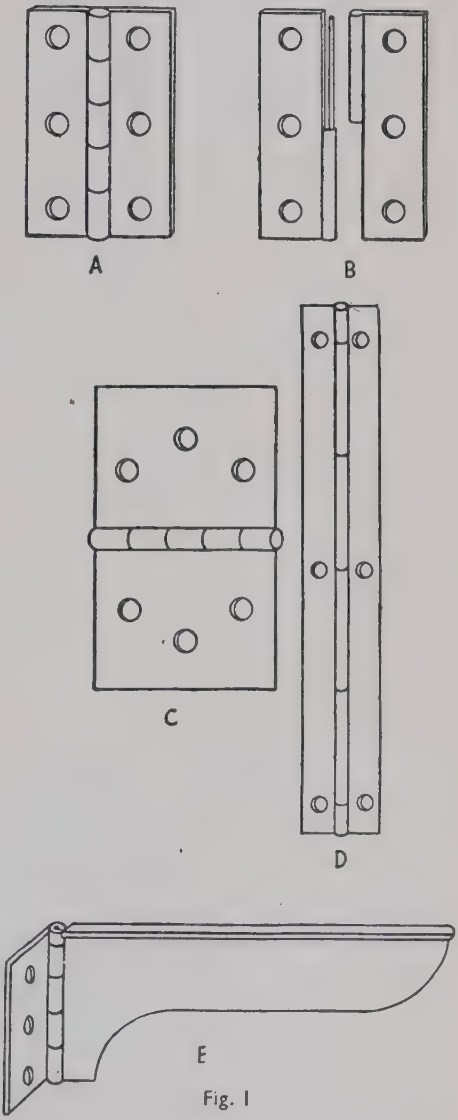


Fig. 1

This is useful for supporting the flaps of tables, etc., and is fitted simply by screwing it to the rail of the table.

In fitting ordinary butt hinges it is usual to sink the leaves or flaps into the member forming the joint, as shown at A in Fig. 2, although in some cases, as in B, it may be advisable to sink both leaves into one member only.

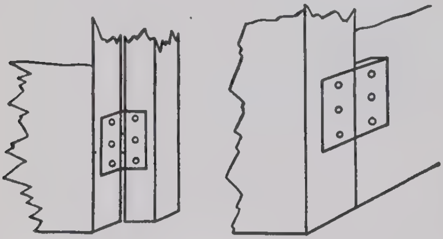


Fig. 2

Before fitting hinges, always mark their position on the work and pay special attention that the pinned joints are parallel with the edges of the work.

Housing Joint.—Fig. 1 shows a through housing-joint. Grooves equal in width to the thickness of the shelves are cut in the uprights with the aid of a tenon saw and chisel. The uprights are of thicker material than the shelves, as shown. The depth of the grooves is generally one-third the thickness of the wood and allowance for the depth of the grooves must be added to the effective length of the shelves. The ends of the shelves are then glued and inserted into the grooves.

A neater form is shown in Fig. 2. The grooves terminate at a short distance from the edges, while the ends of the shelves are cut away to enable them to butt up against the front inside faces.

Lead.—A dull bluish-grey coloured common metal, very soft, heavy and ductile. Used extensively in the form of sheets for covering flat roofs, thin strips for making flashings (see flashings), pipes for cold water, electric storage batteries and sheathing for electric cables. It can be cast easily as it melts at a temperature of only 620 deg. F. An old tenon saw is excellent for cutting lead pipes. A square foot of sheet lead $\frac{1}{8}$ in. thick weighs 7.4 lb. It can be worked into all shapes by beating it with hardwood tools obtainable for the purpose.

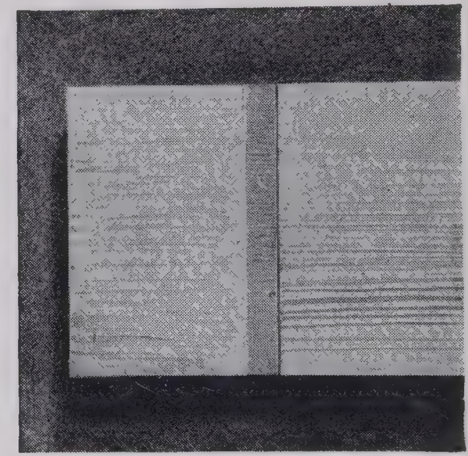


Fig. 1

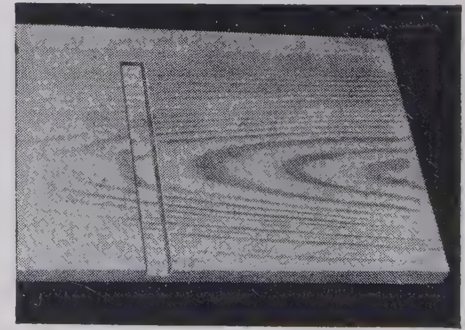
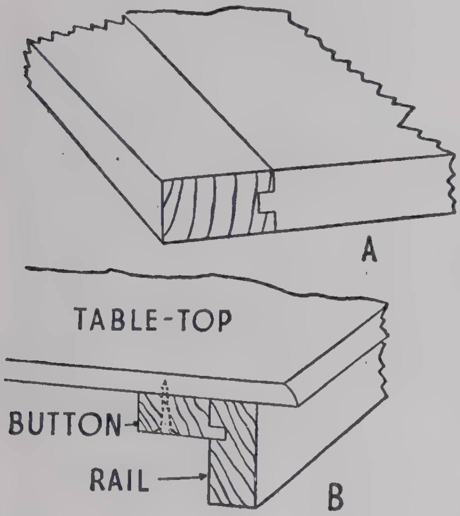


Fig. 2

Ledged Joint.—A common woodworking joint used principally at the ends of boards to prevent twisting. The ends of the boards have ledges; that is, they are cut to form a tongue which fits into a corresponding groove in the end pieces as illustrated at A in the figure, while the sketch at B shows the ledged buttons as applied to a table for fixing the top to the rails.



Ledged Joint

Locks, Bolts and Fastenings.—The fitting of locks, bolts and other woodwork fastenings calls for neat and accurate work. Fig. 1 shows a number of locks. For common doors, such as those used for sheds, greenhouses and house doors where appearance is not of importance, the ordinary rim lock as illustrated at A may be used. To fit, first mark the position, usually in the middle rail or lock-rail, and cut a shallow recess on the front edge of the door to take the front plate or flange. This enables it to be flush with the edge of the door. Then hold the lock in position and mark the centres for the spindle and keyhole. With a sharp twist-bit, a trifle larger than the diagonal thickness of the spindle, bore the spindle hole, taking care to make it square with the face of the door. Now, cut the keyhole by boring two holes, one at the top and one at the bottom. The next operation is to remove the waste between them with a pad saw. Before making screw holes, place the lock temporarily in position, insert the spindle and key from the outside to see that they work satisfactorily. If everything is as it should be, the lock can be fixed permanently. The final operation consists of fitting the box staple that receives the latch to the frame.

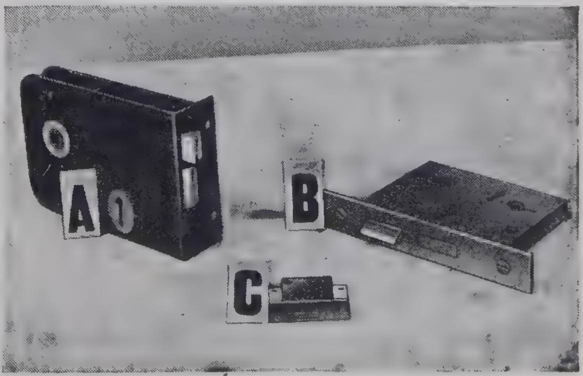


Fig. 1

The lock shown at B is known as a mortice lock because the body is housed in a mortice cut into the edge of the door.

The fitting of this type of lock calls for careful workmanship. Mark the position in the edge of the door where the lock is to go and make the recess by boring a series of holes with a twist-bit a little smaller than the width of the recess, and removing the remaining waste with a chisel. The depth of the mortice should be a trifle longer than the length of the body of the lock plus the fixing plate. Next, accurately mark the positions for the spindle on both sides of the door. First bore these holes on one side only, insert the lock into the mortice to verify that the bored holes correspond with those in the lock and, if such is the case, repeat the operation on the other side, finally removing the waste between the holes of the keyhole.

Insert the lock temporarily in position, put in the key and spindle to see that they work freely, and if correct, fix the lock permanently by driving in the fixing screws. Fix the handles, not forgetting the escutcheon plates that cover the keyholes and the spindle plates.

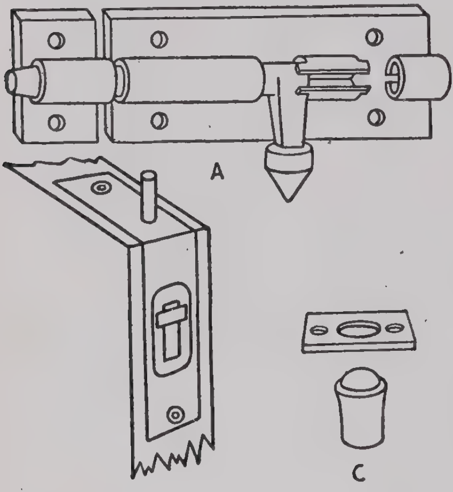


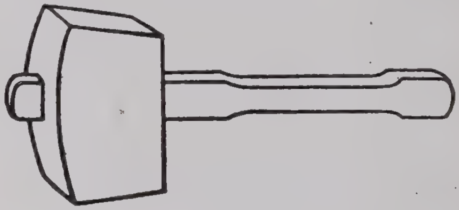
Fig. 2

Finally, cut a recess in the door jamb to take the cover or fixing plate for housing the latches. This plate lies flush with the face of the jamb, and is fixed, as with the lock itself, by means of countersunk-headed screws.

In fitting a drawer lock, C in Fig. 1, the first thing to do is to locate the exact position of the keyhole.

This will come in the centre of the front and at a distance from the top edge equal to that of the top plate of the lock and the pin over which the barrel of the key fits, when the plate lies flush with the top edge. Having marked the position, bore a hole a trifle larger than the barrel of the key and bore a smaller hole below it slightly larger than the thickness of the ward or rectangular part of the key and remove the waste between the holes. Next, mark and accurately cut the recesses for the top and back plates and then chop out the recess for the box or body containing the mechanism of the lock. Then fix the lock by means of countersunk-headed screws.

Finally, locate, mark and prepare the mortice and recess for the catch plate and fix the plate with screws so that it is quite flush with the face



Mallet

Little difficulty should be experienced in fitting any of the fastenings shown in Fig. 2. The door bolt shown at A is simply screwed to the face of the door first. To ensure the catch being in line with the bolt it is advisable to shoot the bolt, place the catch into the projecting end and drive in the fixing screws.

The blind bolt illustrated at B is usually fitted to the closing edges of the top and bottom rails of the left-hand door. The bolt shoots into a hole bored in the top and bottom of the woodwork.

The ball-catch fastener illustrated at C is a very neat fitting. The ball fitment is let tightly into a hole bored in the top of the opening stile of the door so that only the ball portion projects. The ball fits in a corresponding plate which is recessed into the woodwork and secured by screws.

Mallet.—A woodworker's striking tool made of beech or other hardwood and used principally for striking chisels, gouges and other tools where the use of a hammer would injure the wooden handles. The illustration shows a serviceable mallet weighing about a pound. Note that the shaft projects beyond the top of the head. The shaft is tapered and fits into a corresponding tapered hole in the head. This feature acts as a wedge and tends to tighten the head on the shaft when in use.

Mahogany.—Mahogany is an ideal wood for cabinet-making and other purposes where a strong, durable hardwood is required.

There are many kinds of mahogany and that known as Spanish mahogany is the best and most expensive. It is beautifully marked, of a deep red-brown colour and has a whitish, chalky substance which fills the pores. Spanish mahogany is almost entirely free from knots and other imperfections and does not warp or shrink to any appreciable extent. It can be obtained in very wide boards. For this reason, furniture of the highest class, organ sound-boards tee-squares, and similar articles are made from this wood.

Mahogany from Central America, known as Honduras mahogany, or bay wood, as it is sometimes called, is inferior to Spanish mahogany and is lighter in colour. It is difficult to plane owing to inequality of the texture.

Mahogany takes glue well and an exceptionally brilliant polish can be imparted to it.

Measuring and Marking Wood.—The fate of a piece of constructional woodwork depends almost entirely upon the accuracy exercised in measuring and marking out. Slipshod methods and inaccurate marking out lead to failure.

A good 2 ft. four-fold rule with plainly marked inches and sub-divisions, try square, bevel, marking-gauge, dividers, a sharp-pointed pencil and the ability to use them are necessary for marking out.

In marking a dimension on a board, the rule should be placed on edge and a mark made exactly opposite the figure required as indicated in Fig. 1. This method obviates the possibility of an error in judging the exact spot as often happens when the rule is used flat.

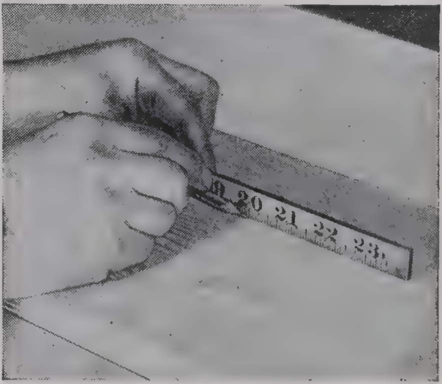


Fig. 1

When measuring a long board with a 2 ft. rule, mark each individual 2 ft. length with a pencil and do not rely upon the accuracy of marking wood with the brass end of the rule, as is often done. The latter method answers the purpose only for rough work.

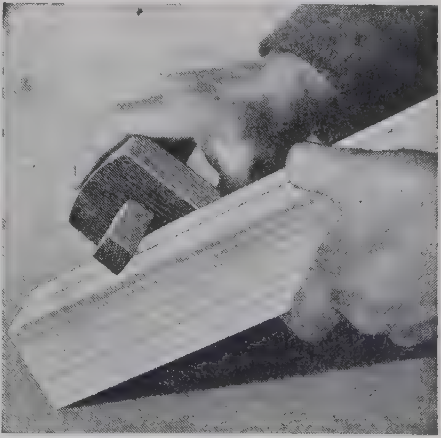


Fig. 2

Various methods are used for marking lines parallel to a planed edge of wood. The usual way, however, is to use a marking-gauge as illustrated in Fig. 2. To use the tool, set the adjustable fence at the desired distance from the point with the aid of a rule. Press the fence tightly against the prepared edge of the work to be marked and draw or push the tool along the work so that the point scores the wood lightly. Then repeat the process in order to obtain a more definite line. The tool should be held so that the point slopes in the opposite direction of motion as indicated in Fig. 2, otherwise the point will score the wood too deeply. Avoid using a marking-gauge having a blunt point; if necessary remove the pin and sharpen it with a fine file. The point should not project more than $\frac{1}{8}$ in. from the bar.

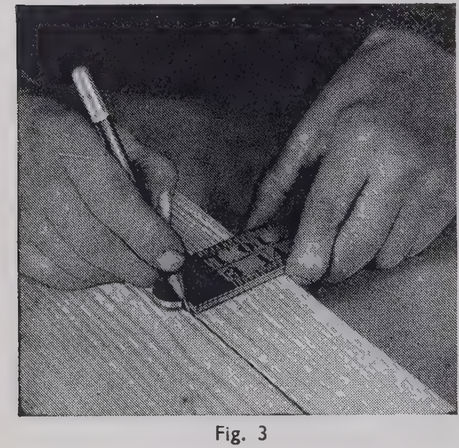


Fig. 3

A quick method of drawing a line parallel to the planed edge of a board, is to hold the rule flatly in the left hand and bring it up to a pencil point resting on a previously marked spot on the board indicating the desired width. The rule and pencil is then run along the board using the forefinger of the left hand as a guide (Fig. 3).

A try square (Fig. 4 A) is used as a guide when it is desired to mark lines at right angles to an edge. The proper way to use it is first to hold the pencil so that its point rests on the exact spot where the line is to be made and then to slide the square along the work until the blade touches the pencil point as shown at B in Fig. 4. The pencil is then drawn along the edge of the blade as indicated by the dotted lines.

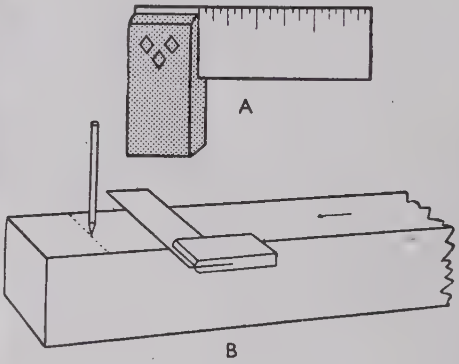


Fig. 4

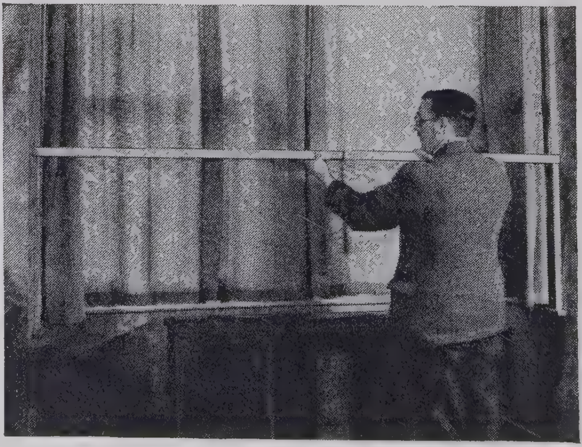


Fig. 5

Fig. 5 shows a pinch rod made out of two thin battens. Such an accessory is useful for gauging the width of recesses

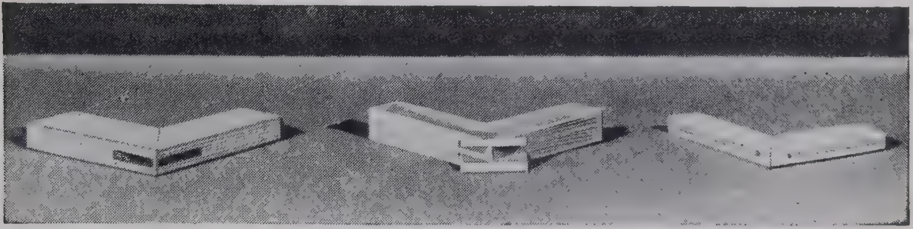


Fig. 1

between walls and similar purposes.

Mitre Joints.—For joining wood at right angles a mitre joint is often employed. As will be seen from the illustrations at A in Fig. 1 the ends of the members to be joined are cut to an angle of 45 deg. so that the joined pieces form a right angle.

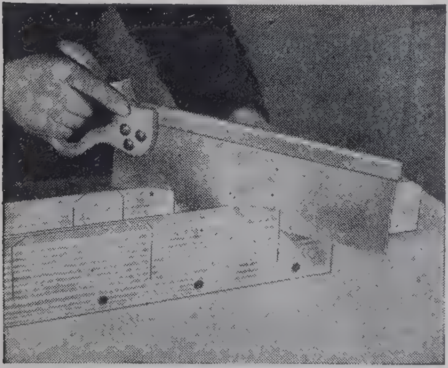


Fig. 2

In forming an ordinary mitre, the ends are first marked out and sawn on a mitre block or in a mitre box (Fig. 2) which guides the saw, and then planed smooth on a mitre shooting-board (see Shooting-board). The ends are then glued and nailed with lost-headed nails, the heads of which are generally punched below the surface, and the small depressions filled with a filler such as plastic wood.

Such a joint is considerably strengthened by the insertion of keys or slips of hardwood that are fitted and glued into saw-kerfs made on the outside edge of the joint as illustrated in Fig. 1B, while a still stronger joint is that shown in Fig. 1C which represents a mitre with a false tenon joint. A slot is made in each end of the parts to be joined as shown, and a slip of wood inserted and glued into the slots.

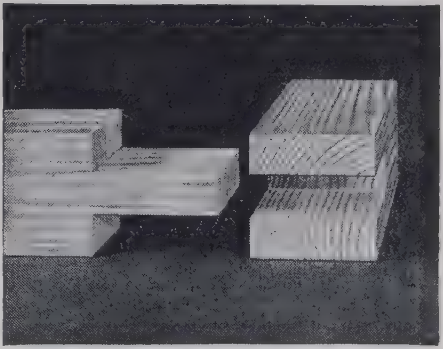


Fig. 1

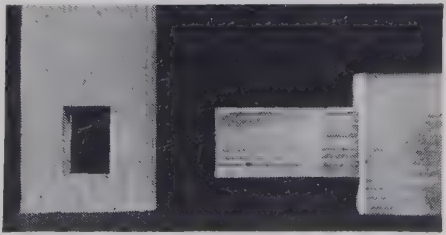


Fig. 2

Mortice and Tenon Joints.—One of the most if not the most important series of joints in woodwork. The joint consists essentially of a tenon or projection on one member that fits into a corresponding rectangular hole, called a mortice, in the part to be joined. A few of the common joints suitable for most amateur work are represented here. That illustrated at Fig. 1 shows a simple, open mortice and tenon, while that at Fig. 2 is a through, closed mortice and tenon, so called because the tenon goes right through the mortice. A stub or stopped tenon (Fig. 3) goes only part way through and so does not show. In Fig. 4 is seen a bare-faced tenon, having only one shoulder, which may be stopped or through. That shown at Fig. 5 is a square-haunched or shouldered tenon, while the tenon illustrated at Fig. 6 is a keyed tenon that projects beyond the mortice and is held in position by means of a wedge or key.

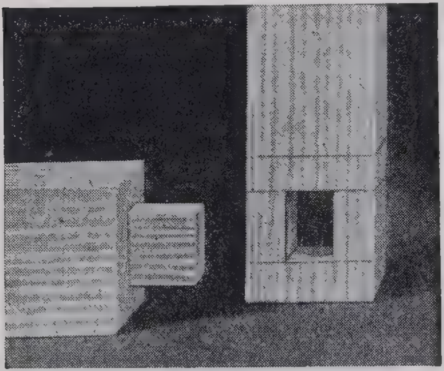


Fig. 3

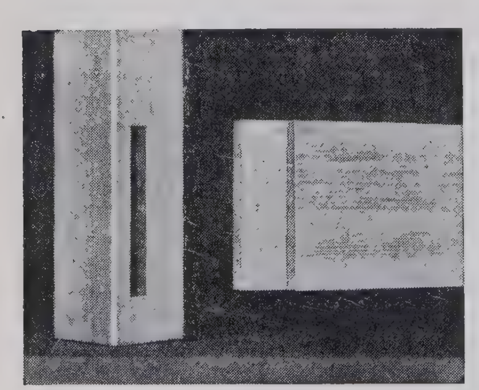


Fig. 4

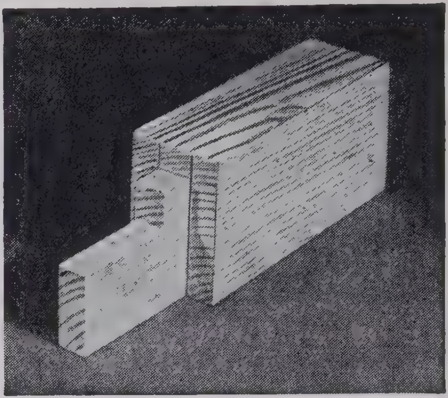


Fig. 5

The success of these joints lies in accurate marking out. Where the joint comes near the end of a piece of work, allow about an inch for waste.

In ordinary work, it is usual to make the tenons one-third the woodthickness.

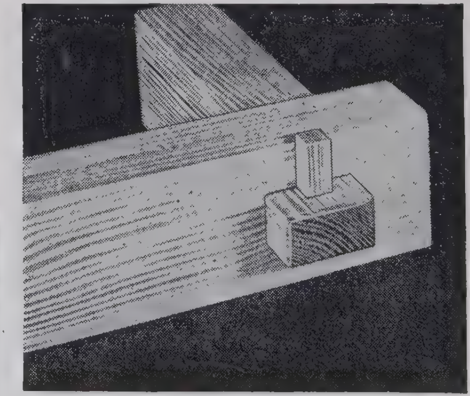


Fig. 6

To make the open mortice and tenon joint, proceed in the following way. With a tenon saw, cut out the depth across the shoulder lines, keeping the saw teeth in the waste part of the wood. Next place the work in a sloping position in the vice and saw down to the shoulder and, if necessary, trim the wide faces of the tenon with a sharp chisel, working in the direction of the grain.

Having marked out the mortice, place

the work in the vice and make two saw cuts down to the depth of the line and remove the waste with a chisel.

In dealing with a through closed mortice and tenon joint, cut the tenon as previously explained and then proceed with the mortice after having marked out on the top and bottom faces. Fix the work in a vice and bore a number of holes close together with a brace and twist-bit a trifle smaller in diameter than the width of the mortice. Bore first from one face to the centre, reverse the work, and continue boring. Then remove the remaining waste with a chisel, taking care to keep the sides and ends of the mortice perfectly square.

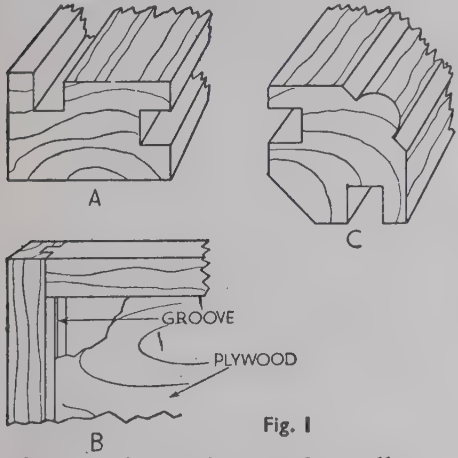


Fig. 1

The same procedure is followed in forming the stub or stopped tenon and mortice except that the mortice is made more or less shallow according to the length of the tenon.

To make the haunched or shouldered through tenon and mortice, make a full tenon first and then mark and saw it down to form the shoulder. Proceed with the mortice as in the through joint, but do not bore right through the mortice in that portion that is to receive the shoulder of the tenon. The depth of the recess is of course equal to the length of the haunch.

The keyed tenon is made longer than the ordinary tenon and must be provided with a rectangular hole into which the key or wedge is inserted.

Mouldings.—Decorative mouldings and grooved mouldings for constructional work are now obtainable at prices little above that of the raw material.

For constructing the framework of cabinets, doors and small carcase work generally, the example given at A in Fig. 1 will be found invaluable. The moulding is made of hardwood which can be stained and the grooves are of a width to take plywood of standard thicknesses. The illustration at B shows the use of grooved mouldings in the construction of a door. A short stub tenon is cut in one member which fits into the groove of the other and when glued forms a substantial joint.

A corner moulding grooved as in the plain type is shown at C in Fig. 1.

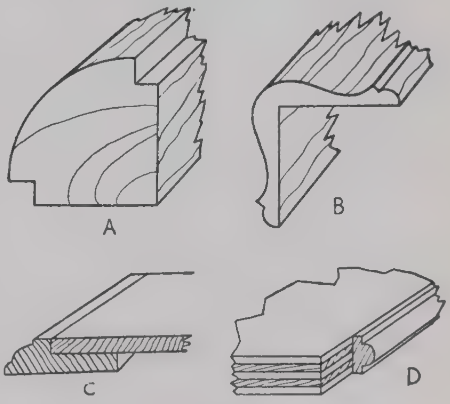


Fig. 2

A flush corner moulding, one of many types, is represented at A in Fig. 2 and is handy for radio cabinets. The use of edge-moulding (B) hides unsightly joints.

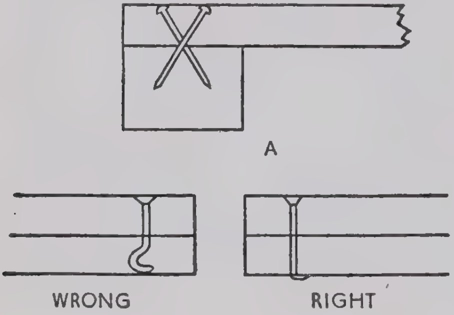
A rebated moulding as seen at C is for edging thin plywood.

It enables a thin piece of wood to be used instead of a thick piece and yet retains the appearance of the latter.

The use of small mouldings, either plain or ornamental, is an ideal method of giving a finish to the unsightly edges of plywood as in the illustration at D.

Picture rail mouldings, moulded skirting boards and other soft wood mouldings are obtainable at most timber merchants.

Nails.—Always use a nail suitable for the job. For common woodwork, where appearance is not of much consequence, the ordinary wire nail with its comparatively large circular head is generally employed. Such a nail has strong gripping power and does not split the wood. If a large head is not wanted, use an oval wire nail which has a small head enabling it to be punched below the surface of the wood. When using this type of nail, see that the widest part of the body is driven in parallel to the direction of the grain to obviate splitting.



Nails

For fixing floorboards, floor-brads having a projection on one side of the head should be employed. The taper faces of these, as well as cut clasp nails and other nails having wedge-shaped bodies, must follow the direction of the grain.

Large-headed, galvanised clout nails should always be used for outside work such as fixing roofing felt and other purposes where an untreated nail would rust. Copper nails should be used for fixing copper and lead, but should not be used for iron or zinc.

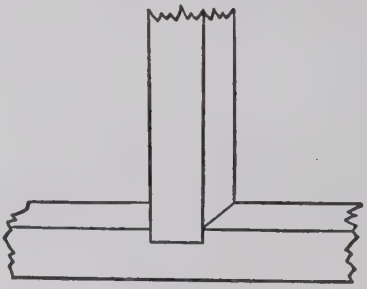
Lost-head wire nails are circular in shape, thin, and have an almost imperceptible head which makes them extremely useful for cabinet work where it is particularly necessary that they should not show. Iron panel pins, not much thicker than ordinary pins, are handy for fretwork purposes, fixing small mouldings and small work in general.

Nails driven in at angles, as indicated in Fig. 1 A, are more effective than nails driven in straight.

Do not drive nails into hardwood without first boring holes for their reception, otherwise the wood is liable to split. The same applies when using large nails in soft wood.

The figure shows the wrong and right way to clinch the ends of the nails.

Nogging.—Nogging is the term given to the short horizontal pieces of wood between and about the middle of studs and uprights in a hollow partition and the like.



Notched Joint

Notched Joint.—The illustration shows a common form of notched joint, such as could be formed in the top and bottom plates to accommodate the ends of studs or uprights in the framework of partitions and sheds. Such a joint gives greater stability than a nailed butt-joint and keeps the uprights at the correct distance apart. The joint is formed by first marking out on the face of the plate two guide lines representing the thickness of the part to be joined, and two depth lines, usually about ½ in., on the front and back faces. The waste is then removed with the aid of a tenon saw and chisel.

Oak.—One of the most useful hardwoods in existence, of which there are many varieties. All have the same general characteristics and vary in colour from light brown to dark brown. Hard British oak, known as pedunculate oak, is suitable for outside purposes such as fences but is liable to twist and warp and is therefore generally unsuitable for furniture and cabinet making. Sesselflora oak, another British product, is softer than pedunculate oak and has a straight grain. It is easy to work but difficult to obtain.

For all ordinary work such as furniture making, Japanese oak is recommended. It is straight-grained and mild and can be obtained in boards up to 11 in. wide and about 8 ft. in length, and is cheaper than oak imported from Austria.

Oilstones.—It is impossible to turn out good work with blunt tools. The cutting edge of a tool, such as a plane-iron, after being ground is too coarse to be of practical use. To produce a keen edge, the tool must have further treatment and this is done by honing it on an oilstone. This has a cutting action like a grindstone, but it cuts more slowly and produces a keener edge. There is no need to re-grind the tool every time it becomes blunt; a few rubs on an oilstone will soon restore a keen edge.

There are numerous kinds of oilstones, some of which are natural stone while others are manufactured. The best kind for carpenters' tools is one of medium coarseness and a Washita stone will generally give good results. Where an extremely keen edge is required, the work should be finished on a fine stone. Some workers prefer a manufactured stone such as the India stone. This may be obtained with two sides, one face of medium grit and the other fine.

For honing plane-irons or chisels, a stone measuring from 6 in. to 8 in. long and 2 in. wide will serve.

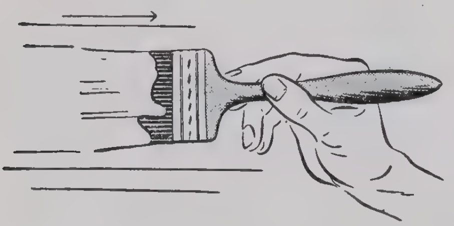
An oilstone should be protected by sinking it partially into a block of wood or box and, when not in use, the exposed part should be covered with a dustproof lid. The stone should be a hand-tight fit in the block so that it can be removed easily. To prevent the stone from slipping about when in use on the bench it is a good plan to drive in a couple of nails minus their heads in the bottom of the block. The pegs should project about $\frac{1}{16}$ in.

Using an Oilstone

Before putting a new stone into service, soak it in oil for a few days. This does not apply to India stones as they are oil-treated already.

The process of whetting or honing is very simple. In the case of plane-irons and chisels, it is simply a matter of rubbing the bevelled edge of the blade in a correct manner on the surface of the stone. As an example, let us assume that the cutting-iron of a plane has to be treated.

Put a few spots of oil on the stone and wipe it thoroughly clean with a fluffless rag to ensure that no grit is on the surface. Next put a little more oil on the stone and place the bevel of the blade on the stone, holding it in the manner indicated in the illustration. Now raise the back a trifle so that only the cutting edge remains on the stone and rub the blade to and fro along the surface, applying moderate pressure. If the stone is not sufficiently wide to accommodate the entire width of the blade, hold it in an oblique position as shown, without altering the cutting angle. It is essential to avoid rocking the blade, otherwise a curved edge will result.


Painting

Having given the blade about a dozen strokes, turn it over perfectly flat on the stone and give two or three light rubs to remove the wire edge. Failure to keep the blade flat will spoil the cutting edge.

Do not use thick oil to lubricate the stone. A mixture of machine oil and paraffin will serve, or cycle oil.

After much use the stone may become glazed so that the edge of the tool being honed does not bite, but tends to slide along it. When this occurs, wash the stone well with paraffin.

Do not use a stone that has become hollow from wear, but true it up by rubbing its surface on a flagstone moistened with a paste of silver sand and water.

Painting.—Painting requires as much care and forethought as any other mechanical process. Slipshod methods are never successful.

The kind of paint used for a particular job depends on the surface to be covered, whether it be wood, metal or stone, but they are all applied in much the same way.

Before attempting to paint new woodwork, see that it is perfectly dry and rub over the surface with glass-paper as it is impossible to obtain a good finish if the groundwork is rough. Then treat all knots with knotting, which is a solution of shellac in methylated spirit obtainable at most oil stores. On no account must the knotting process be omitted, or the knots will absorb the paint and mar the finished work.

Remove all dust from the work, using a brush for the purpose. An ordinary duster should not be used as it leaves fluff behind.

The next operation consists of applying the first, or priming, coat of paint. Priming paint is composed of red and white lead mixed with linseed oil and is sold ready made. Use a good brush as a cheap one generally casts its bristles. Before use, thoroughly stir the paint with a stick, not a brush, so that no solid ingredients remain in the bottom of the container. Use a well-known and reliable brand of paint.

When applying the paint, work first in one direction and then in the other and lay off in the direction of the grain, as indicated. When dry, stop up holes and other imperfections with putty, lightly glass-paper the surface and remove all dust.

The next coat should be of undercoating; that is, a flat paint without gloss specially prepared for the purpose. This is applied in exactly the same way as the priming and, when dry, glass-papered and dusted, followed either by a further undercoat or by the finishing coat. To make a good job, two undercoats should be given, for the purpose of paint is to give a pleasing finish and to preserve the wood.

Where a rich, glossy finish is desired, a good hard-gloss paint should be used; but for a duller surface ordinary oil paint may be employed. The former is usually sold by the pint, half a pint generally being sufficient to cover about 50 sq. ft., while the latter is sold by the pound, which is usually enough to cover about 25 sq. ft.

Ordinary oil paint is applied in the same way as the undercoat, but a slightly different treatment is necessary when using gloss paint as it contains a proportion of varnish. During cold weather it is better to work with gloss paint in a warm room, and if the paint is thick and difficult to work the container should be placed in a bowl of warm water. Turpentine, or other thinners, should not be used with gloss paint as interference with the proportions will reduce durability and brilliance. Apply the paint first in one direction and then the other and finish off with long gentle sweeps with the tip of the brush, making sure that the whole of the surface is covered. Any attempt at painting an untreated spot when the paint is nearly set will result in an unsightly patch. If the work is well done the brush marks will fade away, leaving a surface which, when dry, will be hard and mirror-like.

In painting over old paintwork, which must be in fairly good condition, dust, glass-paper and wash the surface thoroughly with clean warm water and sugar soap to remove all grease and dirt. When quite dry, apply an undercoat and finish either with ordinary or gloss paint.

Paper-hanging. — Hanging wallpaper requires the following simple tools; A stripping tool of a suitable pattern for removing the old paper, a brush for applying the paste, a rule, a pair of large scissors, a plumb-bob and line, a brush such as a fairly stiff clothes brush for smoothing the paper when being hung, a bucket of water for soaking the old paper, an old distemper brush for applying the water, a small quantity of Keene's cement for stopping up cracks and holes in the plaster, some glue-size for sizing the walls, a supply of special cold water paste flour (obtainable with the size and Keene's cement at wallpaper shops), a pair of steps, and a table upon which to paste the paper.

Although new wallpaper can be hung on the old if the latter is in good condition, it is better to remove it and start afresh.

Stripping old unvarnished paper off the walls is a simple operation. First soak the paper thoroughly with plenty of water applied with an old distemper brush or sponge. Allow sufficient time for the water to penetrate the paper and remove the latter with the stripper. This tool should be held at an angle so that the working edge lifts the paper from the wall, and care must be taken not to allow the blade to dig into the plaster.

Having removed every particle of paper, stop up all holes and cracks in the plaster with Keene's cement (see Distempering) and apply a coat of glue-size to fill the pores.

As a beginner you are advised to start operations on a small and unimportant room before attempting work on, say, a lounge or staircase. Choose a paper of medium thickness and with a small pattern. Large patterns look well in a large room, but are out of place in a small one. Also, select a predominating tint which harmonises with the paintwork and hangings.

English wallpapers are sold by the roll or piece containing about 12 yd. The width is 22 in., including a ½ in.

margin on each side for trimming.

The number of pieces required is easily calculated, but it is wise to obtain an extra piece to make up for waste.

Before trimming off a margin, a decision must be made as to the method to be adopted in joining the edges when hanging the paper. Either a butt-joint or a lap can be employed. The former involves the trimming of both margins as the trimmed edges butt close together on the wall, while the latter requires the removal of only one, as the trimmed edge of one section laps over the margin of the other.

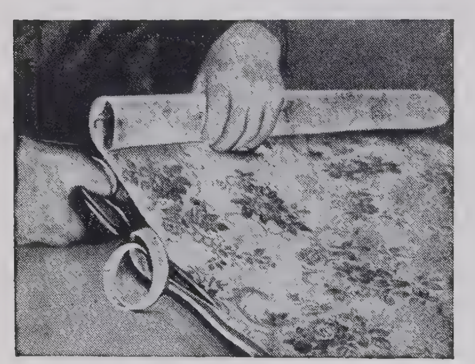


Fig. 1

Butt-joints are to be preferred to lap-joints, but the edges must be perfectly true. Lap-joints are apt to show a ridge where one piece overlaps the other and, in hanging, the lap must be so arranged that the edge of the joint does not show when entering the room.

Wallpaper may be conveniently purchased at shops dealing in home-decoration goods, who usually trim, free of cost, one or both edges as required, on a machine.

If you prefer to trim the paper yourself it can be done on the table as indicated in Fig. 1, but it is better to sit on a chair and proceed as shown in Fig. 2. Here, the worker is seen operating the scissors with his right hand and, as the work proceeds, he rolls up the trimmed portion at the same time pulling the paper with his left hand and thus unrolling the remainder at his feet.

The next operation consists of cutting the paper from the roll into sections. Measure the distance between the ceiling or picture rail if there is a frieze, and the top of the skirting board and allow 3 in. at each end for trimming. In cutting the sections of patterned paper be careful to see that the pattern of one piece coincides with the next.

Then follows the pasting. Mix the powder and water in a large bowl or bucket, taking care to see that it is free from lumps. Use a brush at least 4 in. wide and apply the paste evenly over the back of the paper, except for an inch at each end. Do not allow the paste to come in contact with the table top as this will spoil the next piece to be pasted. To avoid this it is a good plan to spread sheets of newspaper over the table top. Those at the front and back can be pulled so as to expose a clean surface at the long edges of the wallpaper after each successive pasting. Now loosely

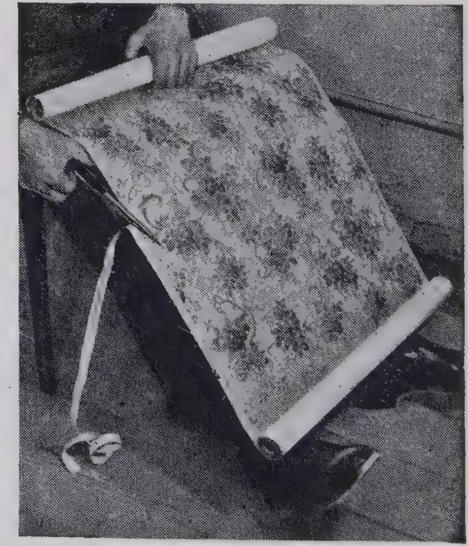


Fig. 2

fold the pasted paper so that the ends meet about 6 in. or so from the centre and, holding it at this point between the finger and thumb of each hand, carry it with arms outstretched to where it is to be hung.

Unfold the top section of the folded sheet and place it in position, allowing 3 in. overlap at the top which must be cut away afterwards for trimming purposes and taking care to see that the piece is absolutely vertical. Now brush out the creases by working the brush upwards and downwards and then unfold the lower portion and continue brushing. Trim off the waste from the top and bottom by first scoring the paper with the point of the scissors, pulling the paper away a few inches from the wall and cutting along the guide lines. Replace the paper with the aid of the brush. Carry on as before.

A good place to hang the first piece is at a window, as indicated at A in Fig. 3, where the edge of the frame is vertical. As it is essential that the edge X of the first piece be quite upright, the edge of the frame should be tested with a plumb-bob. If correct, proceed in the direction shown by the arrow, towards B which represents an upright of a door frame. Then start from the opposite side of the window C and follow round the room to the other door-frame edge D, the surface under the window and over the door being the last pieces to hang.

Picture Rails.—The appearance of a room is sometimes enhanced by a picture rail. Apart from the primary object of such a rail, a light frieze between rail and ceiling has great reflecting power and therefore tends to make the room lighter.

The fitting of a picture rail is only a matter of a few hours' work.

Select a narrow moulding if the room is small as a deep one would look out of place, and remember that mouldings of elaborate design are a thing of the past, comparatively plain rails having taken their place.

Having acquired the necessary amount of material, with an extra 10 per cent. for waste, stop the knots with knotting and give the moulding a primary coat of paint; the finishing coats may be given when the rail is in position.

Saw the pieces to length and make either internal or external mitre joints to suit the angles of the walls.

In fixing the rail, it will usually be found better to keep the picture rail at the same height as the top of the door frame or a little below rather than above it. This, however, will depend upon whether the horizontal mortar joint between the bricks into which the fixing nails are driven happens to come in line or below the level of the frames.

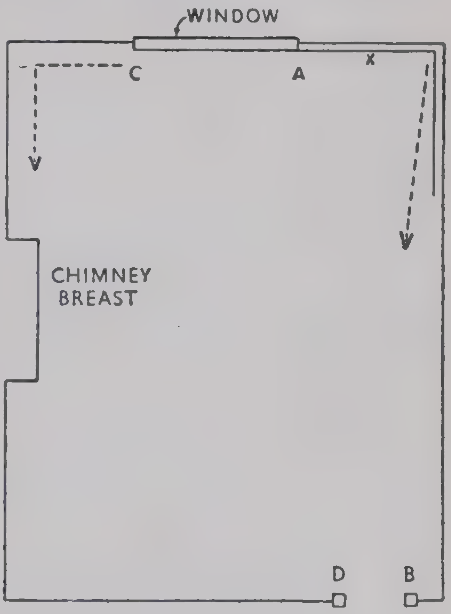
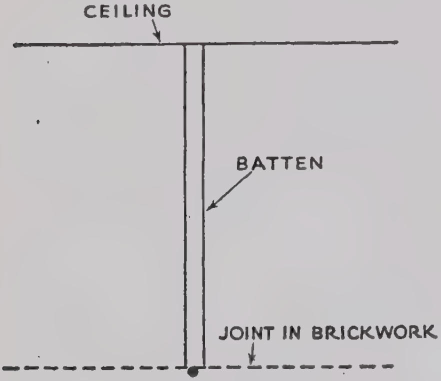


Fig. 3

To find the course, measure on the wall a distance of 2½ in. below the ceiling, as this is about the usual point under the ceiling where the first course comes. Below this position, longitudinal courses will be found at intervals of 3 in. Locate the course by driving a fine bradawl into the plaster. If it goes in deeply it may be taken that the course has been found, but it is wise to verify this by inserting the bradawl at other positions in line with the original one.



Then trace a line round the wall by first marking a piece of batten indicating the distance from the ceiling to the course and using this for measuring, as indicated above.

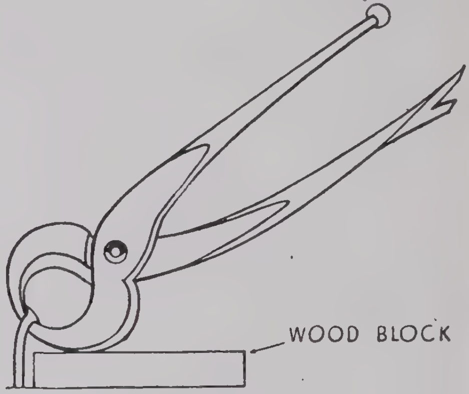
Use 2 in. cut-nails and drive them in at intervals of about 18 in. Sink the nail heads below the surface with a nail punch, stop up the holes with putty, give the rails one or two undercoats of paint and finish with ordinary or hard-gloss paint.

In fixing the picture rails to coke-breeze walls there is no need to find the mortar joints as nails can be driven in quite easily.

If the rail is to be fixed to a lath and plaster partition, find the vertical wooden studs and fix to these.

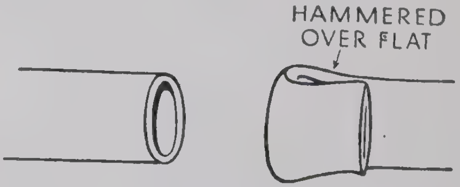
Pincers.—A woodworker's tool for withdrawing nails. Its power is derived from the leverage obtained between the jaws that grip the nail and the handles, the jaw forming the fulcrum of the lever. The figure shows the correct way to withdraw a nail. Note that a piece of wood is inserted between the jaw of the tool and the work to prevent damage to the latter. An overall length of 6 in. is a serviceable size to have.

Pine, Yellow.—A useful, soft, straight-grained wood obtained from North America. It is very easy to work, remarkably free from knots and does not shrink and twist to any appreciable extent. It is softer but less durable than deal and liable to rot if exposed to moisture. Excellent for joinery work, panelling, backs of cabinets, parts of musical instruments and cupboards. It is more expensive than deal and can be obtained in boards up to 36 in. in width. Yellow pine is now scarce.



Withdrawing a Nail

Pipes, Burst Water.—If a water pipe bursts inside the house, proceed as follows: Should it be a serious burst in the main supply pipe that feeds the cistern, cut off the supply at the stop-cock to be found either inside the premises or below ground near the



A Temporary Measure

front entrance, and call in a plumber to effect the repair.

A small puncture in such a pipe can generally be sealed temporarily by lightly tapping the lead round the defective spot, or adhesive tape bound round the pipe may be applied as a temporary measure.

If a bad burst occurs in a pipe fed from a cistern, tie up the floating ball which operates the main water inlet valve and plug the outlet with a piece of wood if the tank is not provided with an outlet stop-cock. Empty the pipes of water, saw across the faulty pipe using an old tenon saw, turn up the live end and hammer it flat. See illustration.

The water can be allowed then to circulate to other taps by removing the stopper and releasing the ball valve of the tank, until a permanent repair can be effected.

Planes.—The three principal planes used by the joiner for smoothing and truing up wood are the jack, trying and smoothing plane, but his equipment is supplemented by a number of others for special purposes including a rebate plane for making rectangular cuts or rebates on the edges of wood, the plough for cutting grooves in or near the edges of wood, and others. Planes may be of wood or metal.

For amateur use, the metal plane is advisable for several reasons. First, the cutting edge of the plane-iron is very much easier to adjust. Wooden planes have wedges to keep the cutters in position. Second, metal planes keep their shape and do not wear on the sole or bottom face as wooden ones do.

Although the initial cost of metal planes is greater, such tools will give many years of service provided they are properly looked after.

The home carpenter should pay a reasonable price for a good plane as he cannot expect to get good service from cheap tools.

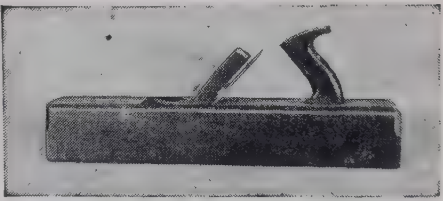


Fig. 1

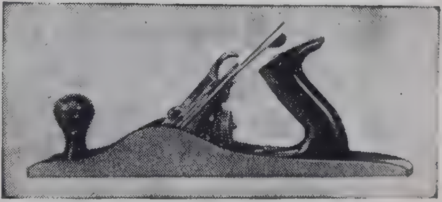


Fig. 2

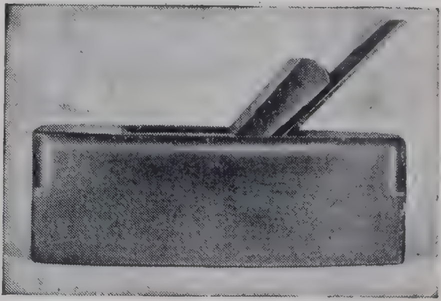


Fig. 3

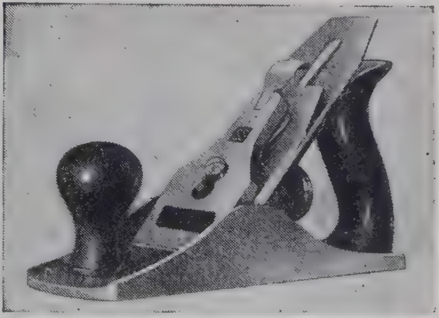


Fig. 4

Figs. 1-4 show a representative group of planes, both of wood and metal. That illustrated at Fig. 1 is a jack plane, the most frequently used plane in the joiner's outfit, with wooden stock or body, with its metal counterpart Fig. 2,

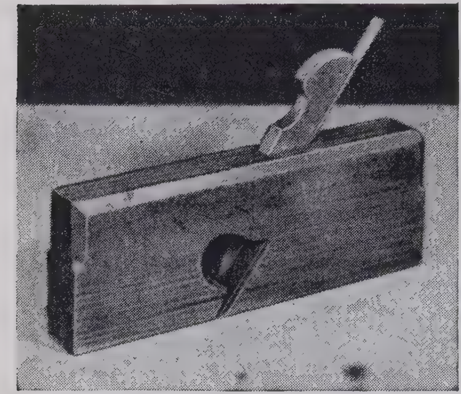


Fig. 5

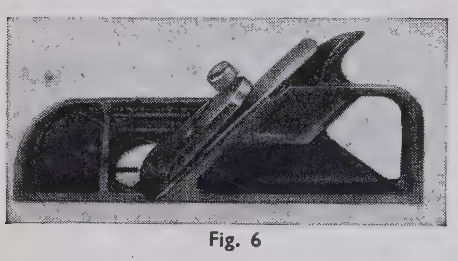


Fig. 6

while smoothing planes of both types are seen at Figs. 3 and 4. Rebate planes are shown at Figs. 5 and 6, and a metal combination plane, by which ploughing, beading, tonguing and grooving, rebating can be done, is illustrated at Fig. 7. The last obviates the purchase of separate rebate and plough planes.

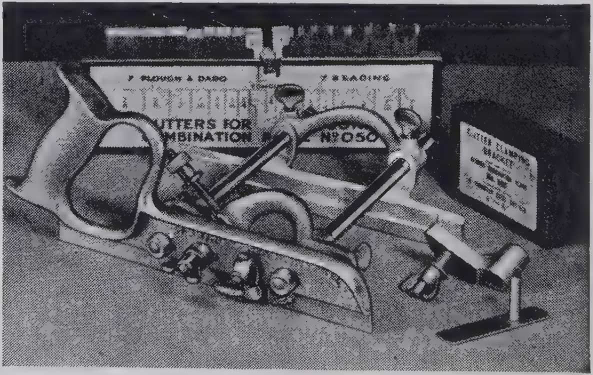


Fig. 7

In planing a rough sawn piece of wood to size, the joiner uses the jack plane roughly to trim the wood and follows with a trying plane to obtain a flat surface. Finally, the surface is finished with the smoothing plane.

For amateur work the trying plane can be omitted, as the jack plane will produce a flat surface.

The jack plane is held in the manner shown in Fig. 8. Try to avoid producing a rounded surface as illustrated in Fig. 9. This is caused by pressure being applied at the wrong places when planing. The pressure should be greater at the front of the plane when beginning the stroke and be transferred to the back towards the end. Another important point is not to set the cutter too deep. It is far less laborious to take off several thin shavings by a number of strokes than to remove a single thick shaving by one stroke and it tends to more accurate work.

In planing the faces of a piece of timber, the tool must be used in the same direction as that of the grain, otherwise the cutter will simply tear up the wood, choke the mouth of the tool and perhaps ruin the work. The cutting edge of a smoothing plane should be set to produce a shaving of only tissue paper thickness as its function is not so much to remove waste as to produce a perfectly smooth surface.

To square up a flat piece of wood such as a board, examine and choose the best side upon which to commence operations. Test this side by applying a straight-edge in all directions. This is best done by laying the edge along the wood and holding it up to the light. If no light appears between the straight-edge and the board it can be taken that it is true. If light shows, the work is twisted or "in winding," as the joiner

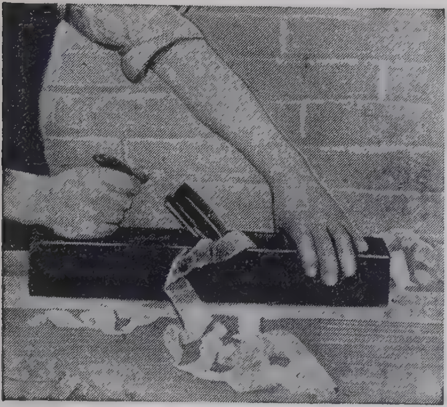


Fig. 8

calls it. To verify whether the wood is in winding or not, apply two strips of hardwood of equal width, having their edges " dead " parallel—called winding strips—in the manner shown at A in Fig. 10, and take a sight over their tops. If the wood is in winding the strips will appear as at B. First plane the high parts down until the edges of the strips appear to coincide and then carry on in the usual manner, using a straight-edge from time to time for guidance.

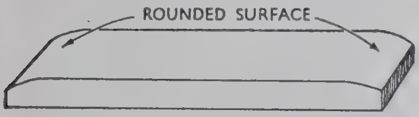


Fig. 9

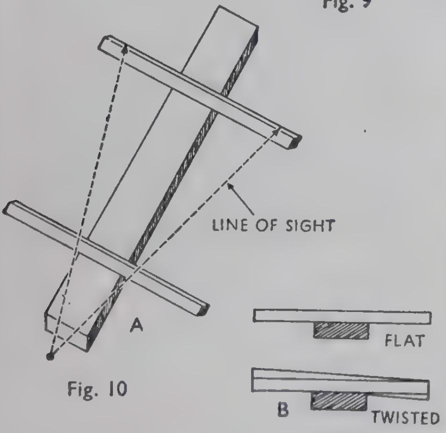


Fig. 10

Having planed this face, called the working face, perfectly flat, plane the edge level along its length and square to the face, then mark the desired depth on both sides from the face and plane to depth. Finally, mark the true width from face to edge and plane to size.

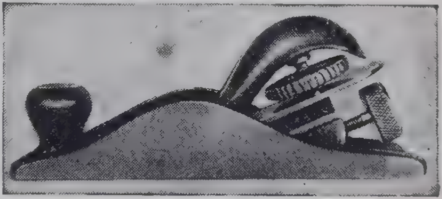


Fig. 11

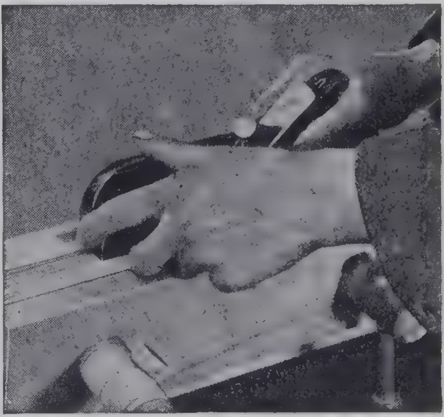


Fig. 12

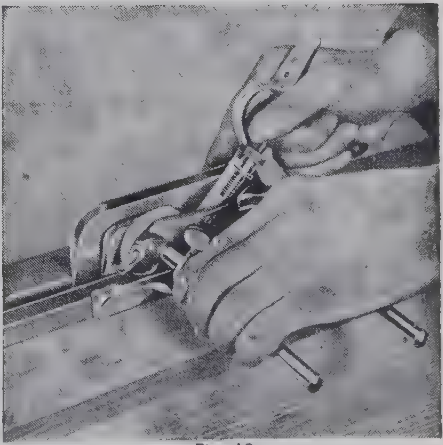


Fig. 13

To prevent ends splitting when planing on end grain, plane from one end towards the centre and then from the other. Use a very keen tool and hold it obliquely so that the cutter has a slicing action. A small block plane, as illustrated in Fig. 11, is handy for this.

A rebating plane has a cutter as wide as the body to enable it to cut into the corner of the rebate at the sides and to allow shavings to escape. The plough plane is fitted with an adjustable fence which keeps the tool at the desired distance from the edge of the work.

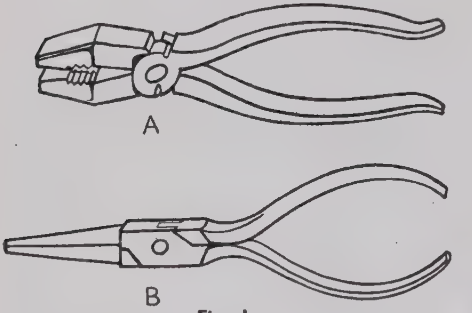


Fig. 1

Fig. 12 shows a metal rebate plane in action, while Fig. 13 illustrates the use of a combination plane used as a plough.

Blunt cutters mean hard labour and are liable to roughen the work. To keep them in working condition, they should be given a rub on an oilstone as soon as any symptoms of dullness appear. The method of sharpening a plane-iron is dealt with under oilstones.

The following hints will enable you to get the best out of your planes. Place a plane on its side when temporarily out of commission to prevent the cutting edge from damage. Hammer heads and other metal are likely to come in contact with the cutting edge and chip it and if this happens it means re-grinding. Withdraw the cutter a trifle into the body before putting away. Remember that a smoothing plane is not for rough work. For easy working, smear a spot or two of lubricating oil on the sole.

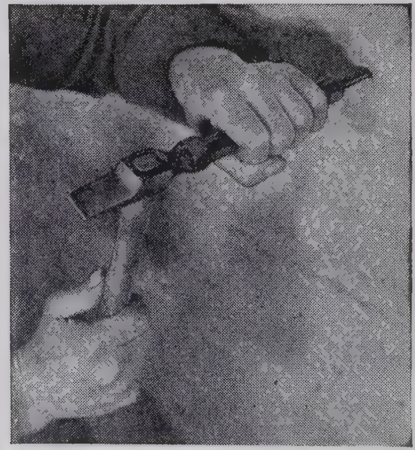
Pliers.—A useful tool for many purposes for the metalworker as well as the woodworker. Those with side cutters are preferred to the plain type as they may be used for cutting wire. Pliers measuring 6 in. overall, as illustrated at A in Fig. 1, are suitable for general purposes, while those at B are the correct size for wireless and similar work. Do not use pliers for withdrawing nails, or you will strain the jaws.

Plugging Walls.—It is often necessary to plug a brick wall to obtain a firm fixing for a fitment of some kind.

Small hollow fibre plugs known as rawlplugs are the most modern method.

These involve the use of a special tool consisting of a hardened steel bit to suit the size of the plug and a metal holder (see illustration).

Mark the position where the plug is required, apply the point of the tool at that position and give the end of the holder a series of light blows until the hole is sufficiently deep to allow the end of the plug to lie flush with the surface. The plug is inserted, and the fixing screw driven into the plug which expands and grips it firmly.



Plugging Walls

Plywood.—The advent of plywood has reduced the cost of constructing wooden articles to a minimum. This useful material is sold in the form of sheets consisting of a number of layers or plys of thin wood cemented together under pressure. The grain of one layer of wood crosses that of the next, a feature which gives great strength to the finished material and prevents it shrinking.

Plywood is obtainable in standard size sheets measuring as much as 7 × 5 ft. wide, but smaller panels 24 × 24 in., 48 × 24 in., and 48 × 48 in. are the usual stock sizes. The thickness ranges from 3 millimetres, equivalent to approximately $\frac{1}{8}$ in., to 25 millimetres or 1 in. Plywood is faced with either common wood, birch, alder or deal, or more expensive woods such as oak, mahogany, walnut and all of these may be obtained in several qualities.

Common plywood is useful for many purposes, including the backs of cabinets, cladding unimportant cupboards where utility and cheapness are of more consequence than looks. Plywood faced with a better class wood is ideal for making panels, table tops and other parts of furniture where a good appearance is necessary and the cost of ordinary wood prohibitive. Metal-faced plywood is also obtainable and is admirable for making the chassis of radio sets.

Posts.—It is a great mistake to use wooden posts where they are subject to the weather without treating them to delay rot. This applies particularly to the portion of the post which is buried in the ground. Tar applied hot is effective, but boiling creosote is better. As the process of boiling the creosote is a rather dangerous operation, the ends of the posts may be stood upright in a suitable container such as an old milk churn or an upright barrel holding the cold liquid. The depth of creosote should be such as to cover the portion of the post sunk in the ground plus 6 or 7 in. It is at ground level, as shown in Fig. 1, that most rotting usually takes place. Two or three hours' treatment in this way, adding more liquid to make up for that absorbed by the wood, will add greatly to the life of the post.

Another method is to char the end of the post, but the best method of all is to set the post in concrete.

Prepared Wood.—Prepared stuff, in woodworker's parlance, means rough sawn timber that has been machine-planed and therefore requires little smoothing, a desirable feature as it saves a lot of planing. In purchasing ready planed wood, note that the finished sizes are $\frac{1}{8}$ in. under in width and thickness owing to waste in machining. Thus, 2 × 2 in. prepared stuff measures only $1\frac{7}{8} \times 1\frac{7}{8}$ in., and a $7 \times \frac{3}{4}$ in. prepared board is $6\frac{7}{8} \times \frac{5}{8}$ in. thick.

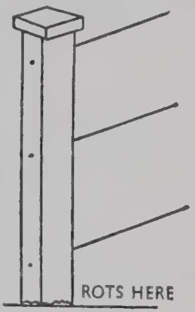


Fig. 1

Pulpwood.—A useful material made from wood pulp and compressed into sheets. It is used principally for cladding partitions, ceilings and for similar purposes. It is sold under various trade names and in different thicknesses and qualities. Standard size sheets measure from 6 to 16 ft. in length and 3 ft. and 4 ft. in width. Some kinds are soft and spongy while others are hard and close-grained, which renders them practically moisture-proof and fireproof. They can be sawn and the edges can be planed, provided a sharp tool is used. Pulpwood can be nailed without fear of splitting.

Punches.—The woodworker's punch is used principally for sinking the heads of nails below the surface of wood. In important work the holes are afterwards filled up. The heads of large nails are usually sunk with a rectangular punch having a smooth working end; punches for sinking small-headed nails such as panel pins are generally round in section with a fine cup-shaped end to prevent the tool from slipping off.

A similar tool but larger is used by the metalworker for forming the bottoms of rivets, while a pointed punch is used for marking the positions of holes in preparation to drilling. The depressions left by such a punch are known as pop holes. Fig. 1 shows the three types of punches mentioned.

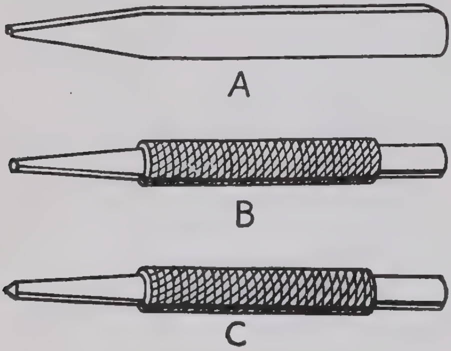


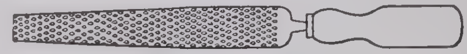
Fig. 1

Putty.—Putty is a plastic material composed of whiting and linseed oil. It is extremely useful for such purposes as fixing glass in rebates or recesses of sash frames, stopping up holes, cracks and other imperfections in wood, natural or otherwise.

Putty can be bought cheaply or it can be made by mixing a quantity of whiting and linseed oil and kneading it well with the hands to form a semi-solid paste. For outside work, the addition of a small quantity of white lead is an advantage. Putty can be coloured by adding red-ochre, lamp black, or other colours with the whiting.

It is useless to apply putty to bare wood as it will not stick. Before starting the puttying process, give the work a coat of priming paint and then apply the putty.

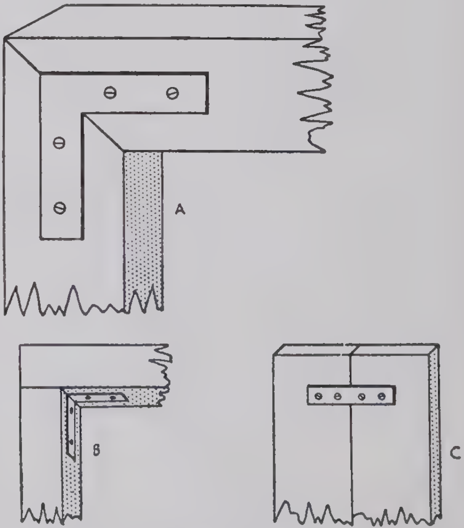
Putty can be kept indefinitely if kept under water. When using putty, place it on a non-absorbent material such as a piece of glass or the oil will be absorbed, to the detriment of the putty.



Rasp

Quartering.—A term applied to timber of square section varying in size from 2 × 2 in. to 6 × 6 in.

Rasp.—A tool for smoothing metal, wood and other material. For rasping or filing wood a half-round medium-smooth tool should be chosen. The rounded face of the tool is particularly useful for smoothing inside curved work after working with a pad saw or bow saw.



Repair Plates

Repair Plates.—The home worker may not be aware that a number of plates of various shapes and sizes are available for repair purposes. These plates, a few are illustrated above, can be obtained in several sizes either in brass or iron, and can be put to many useful purposes other than repairs. As they are thin they may be either let in flush with the surface of the wood or they may be fixed on the face.

The illustration A depicts a flat angle plate used at the back of a mitre frame to reinforce the joint; that shown at B is a right-angled bracket used in a support, and that at C is a flat plate which may be used for joining boards together and for similar purposes.

Rebating.—See grooving and rebating.

Riveting.—Riveting is a method of joining metal where a permanent joint of great strength is required.

There are two common methods of riveting—the hot and the cold. The former is seldom used by the amateur, while the latter is simple and within the scope of the novice.

The essential tools include a ball-pane engineer's hammer for striking the rivets, a drill for boring holes, a file and an anvil or a substitute for an anvil in the shape of a block of hard metal.

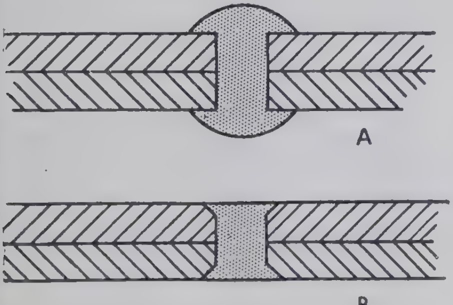


Fig. 1

In riveting two pieces of metal together with snaphead or dome-shaped rivets, as shown at A in Fig. 1, proceed in the following way:

First drill a hole at each end of the pieces to be joined and fasten them together by means of small bolts and nuts in the manner shown in Fig. 2, taking care to see that the edge of one piece overlaps at the correct distance and is parallel to the edge of the other. Then mark, centre-pop and drill the holes through both pieces to fit the rivets and slightly countersink the edges of the holes in both sides.

Having completed the drilling, undo the temporary fastenings and remove any burrs round the holes which may have been thrown up between the plates by the drill. Replace the bolts and nuts and proceed with the riveting. To do this, slip a rivet in a hole and place it head downwards on either the anvil or block and give the end of the rivet a smart blow dead in line with the axis of the rivet, using the flat face of the hammer. This preliminary blow spreads the rivet in the hole. Then, using the ball face of the hammer, gently tap all round the edge of the rivet, striking at an angle of 45 deg. so that the end of the rivet assumes a neat dome-shaped appearance. Continue in this manner until the work is completed.

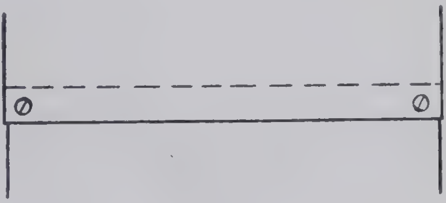
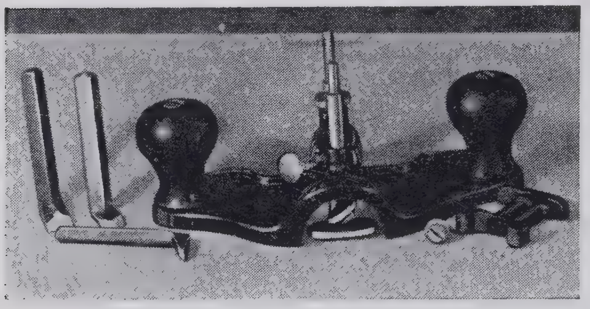


Fig. 2

When using countersunk-headed rivets (B in Fig. 1) which lie flush with the surface of the work, much the same procedure is followed as for the snap-headed type. After drilling, well countersink the top and bottom of the holes and, in closing the rivet, first use the ball face of the hammer until the end of the rivet has spread to the outer edges of the hole and finish off with the flat face of the hammer.

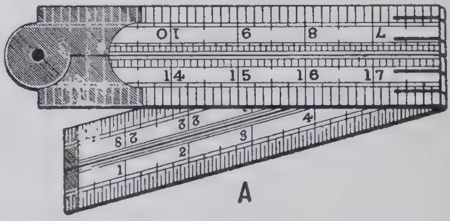
Router.—A special kind of woodworking tool of the plane species for removing the waste in grooves, etc. The tool shown below is the modern edition in metal of its wooden predecessor known as an "old woman's tooth."

Rules.—An indispensable measuring tool for the woodworker and metalworker. Wooden rules are used principally by the former while metal ones are employed by the latter. The home carpenter is advised to use a fourfold two-foot rule, and one having bold figures marked upon its faces is to be preferred. Steel rules a foot long will serve most amateur engineers' requirements.



Router Plane

A carpenter's rule and an engineer's rule are shown at A and B respectively in Fig. 1.



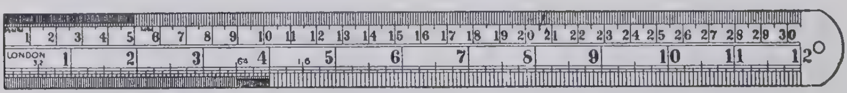


Fig. 1

Saws, Wood.—The saws commonly used for cutting wood are the rip saw, with comparatively wide teeth for sawing timber along the grain; the cross cutting saw having narrower teeth than the rip saw for sawing across the grain; the fine-toothed tenon saw, generally used as a bench tool for cutting tenons, and saws for special purposes such as the pad saw for cutting curved work, both internal and external. To these may be added the bow saw, also used for sawing curved work in thickish timber, and its smaller contemporary the fretsaw, used for a similar purpose on thin wood. These tools are all represented at Fig. 1, page 67.

For amateur purposes, a panel saw will answer the purpose for ripping and cross cutting and thus obviates the necessity of buying two saws, while a tenon saw having a blade 10 in. long, which has a stiffened back of brass or steel in order to keep the blade rigid, will generally suffice for all ordinary bench work, although a smaller one will be an advantage when dealing with thin material.

In using a hand saw and saws of the tenon type, grip the handle with the forefinger extended towards the end of the blade and saw with long, even strokes. Little pressure is needed when sawing if the tool is sharp, and, even if slight pressure is required on the down or forward stroke, the pressure should be entirely relieved on the return or upstroke. Try to avoid the natural

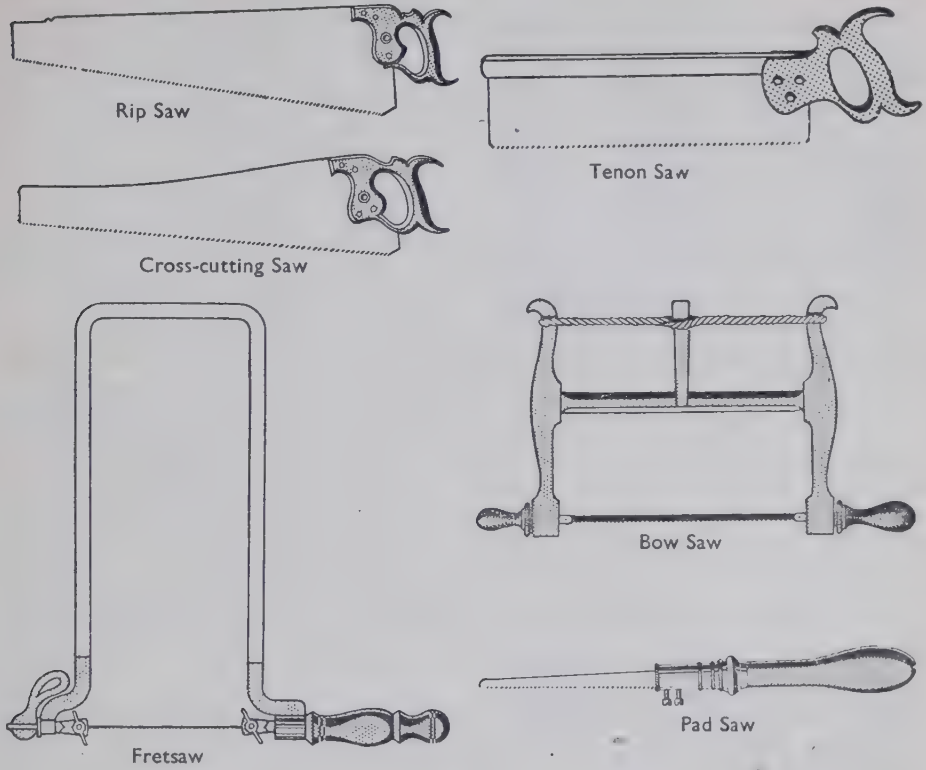


Fig. 1

tendency of tilting the saw; the blade should be kept square with the work.

A tenon saw is generally used for wood held in a vice, but there are times when a piece of work has to be cut on the bench. For this purpose a bench-hook should be used to support the work. Such a device is shown in Fig. 2.

A pad saw is a small tool having a separate blade which is held in the handle by set screws when in use; when not required the blade is housed in the handle.

In using the pad saw, the work is placed in the vice and the handle of the tool gripped with both hands. This saw must be operated carefully as the thin tapered blade is easily buckled. A pad saw in action is depicted in Fig. 3.

A bow saw consists of a handled wooden frame at the ends of which is held a thin and narrow blade. The blade is kept at the correct tension by means of a twisted cord at the opposite end, the cord being kept taught by a thin piece of wood, one end of which is inserted between the cord and the other by the vertical member of the frame.

In use the bow saw is operated in a horizontal position on work held in a vice, while its smaller companion, the steel-framed fretsaw with its delicate fragile blade, is used vertically upon work supported horizontally.

Sawing Stool.—The sawing stool illustrated on page 68 is a great convenience in sawing lengths of wood and should be included in every amateur's workshop. Such a stool can

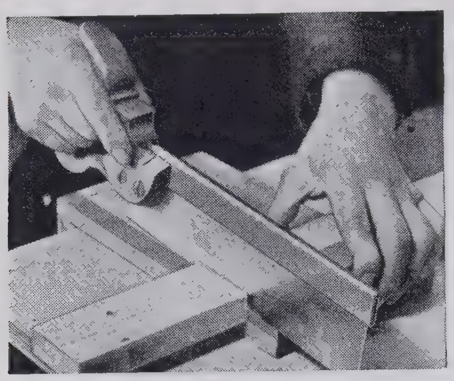


Fig. 2

be constructed within an hour or so.

The top board consists of a piece of 4 × 2 in. planed timber 3 ft. long, while the legs are of $2\frac{1}{2}$ in. square section material about 18 in. high and should be splayed as shown.

Scantlings.—Scantlings are rectangular pieces of timber with sides anything between 2 and 5 in., as, for example, 3 × 2 in., 4 × 3 in., etc.

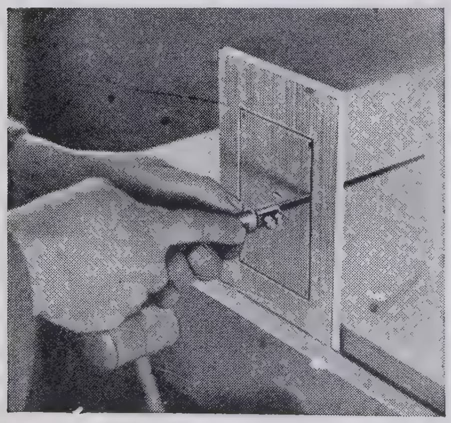
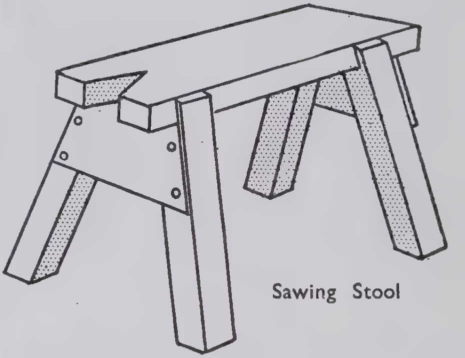


Fig. 3

Scarfed Joints, Wood.—Scarfed joints are used for lengthening timber. That shown at A in Fig. 1 is a simple scarfed joint formed by cutting away one half of the ends to be joined, as shown. Such a joint is useful in joining the plates of horizontal members of framework. The use of a joint of this type allows two or more short lengths of wood to be used instead of a single one of equivalent length. The joint should always be supported by a stud or vertical member.

The joint shown at B is a good form to use when the members are subject to tensional stresses, and, to render them as strong as the uncut portion, fish-plates are invariably used.



Sawing Stool

Scrapers, Wood and Metal.—A wood scraper is a cabinet maker's tool which acts like a very finely set plane and is used principally for smoothing hardwoods. For flat work it consists of nothing more than a thin piece of steel about 5 in. long by 3 in. wide and $\frac{1}{16}$ in. thick, having a burr on its long edges for cutting purposes. The burr is formed by supporting the scraper on

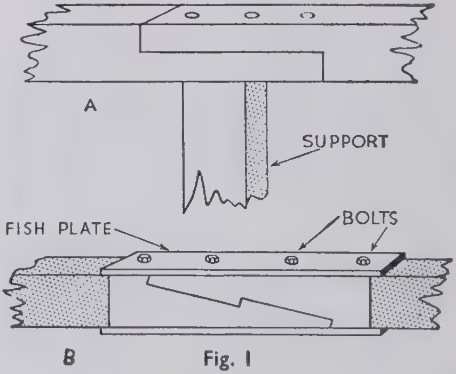
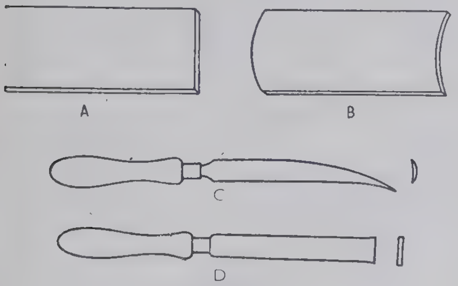


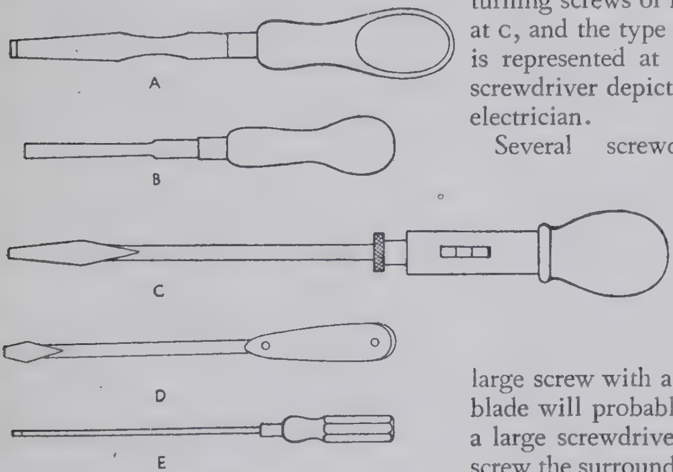
Fig. 1

a bench or other flat surface, allowing its cutting edge to project a trifle beyond the edge of support, and rubbing the edge to be treated back and forth with a piece of hard steel rod held at an angle so as to turn up the edge. Both edges are so treated and then finished on an oilstone. Such a tool is shown at A above.



Scrapers

In use, the tool is held at an angle of about 60 deg. and is gripped in both hands. Some workers prefer to push the tool along the work while others like to pull it. It is imperative that the scraper be held at the correct angle and be perfectly true and sharp.



Screwdrivers

If only a comparatively small surface is to be smoothed, a piece of glass may answer the same purpose.

For curved work, scrapers having convex, B, and concave-shaped cutting edges are to be obtained.

The illustration at C and D show two metal scrapers made of hardened steel used for removing minute quantities of metal to obtain an accurate finish. That shown at C has a curved blade and is a handy tool for treating machine bearings, while it can also be used for flat surfaces. The tool illustrated at D is the correct tool for scraping flat surfaces.

Screwdrivers.—These useful tools are in frequent use by the woodworker, metalworker, electrician and mechanic in general for driving or extracting screws. The illustration shows screwdrivers for various purposes. That illustrated at A is a carpenter's screwdriver, while that seen at B is the tool favoured by the cabinet maker. A general purpose ratchet screwdriver for turning screws of medium size is shown at C, and the type used by the mechanic is represented at D. The long-bladed screwdriver depicted at E is used by the electrician.

Several screwdrivers should be included in a woodworker's kit, proportioned to suit the size of the screws on which they are used. If an attempt is made to turn a large screw with a small screwdriver the blade will probably be ruined, while if a large screwdriver is used on a small screw the surrounding wood will suffer.

Keep the ends of the blades at the correct shape and do not allow them to become blunt as tools in this condition will invariably spoil the screw head.

Screw threads, Cutting. — Screw threads may be cut in metal either by the use of hand-operated tools or by means of a lathe. For ordinary purposes the former method, involving the use of taps and dies, is employed, while the latter is generally confined to making threads on special work where hand-operated tools could not be used.

Happily, most screw threads are standardised to suit the particular work for which they are to be used. For instance, the Whitworth thread is the standard thread for engineering work in general, while the B.A. (British Association) thread is employed for small screws used in electrical instruments, wireless devices and similar objects. Standardised gas threads are used at the ends of gas pipes, and conduit threads are used at the junctions of electrical conduits.

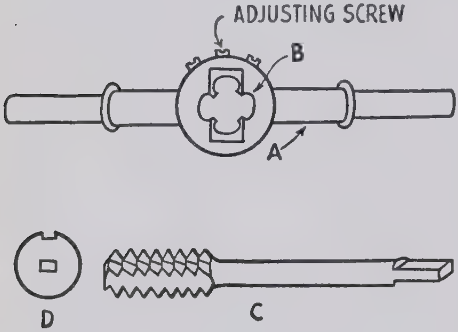


Fig. 1

Fig. 1 shows the tools for making small external and internal threads. The set consists of stock A for holding and turning the die B that is used for cutting external threads, and a tap C for forming internal threads. The tap has a square shoulder at the upper end which engages in a corresponding hole in the centre of a circular piece of metal D which fits into the stock.

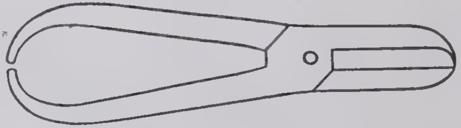
In cutting an external thread, the work is usually placed in a vice, and having removed the sharp edge of the rod the die is simply placed over the work and rotated. In doing this a few threads only should be cut at a time by first rotating the tool in a clockwise direction then reversing the action for a distance of a few threads and then going forward again and so on until the full length of thread has been cut.

Two operations are generally necessary when cutting an internal thread. The first one involves the use of a tapered tap which has only a few full-sized threads at the top cutting portion of the tool, and this is followed by a second tap having only a few tapered threads at the starting end. The tool is used like a die.

When drilling holes which have to be threaded, a tapping size drill—that is, a drill of the same diameter as that of the bottom or root of the thread—must be used. When cutting threads on iron and steel, lubricate with machine oil and use paraffin or turpentine for aluminium. Copper, brass and cast iron are threaded dry.

Scriber.—A thin steel rod with a sharp pointed end used for marking metal in lieu of a pencil, the marks of which are quickly obliterated.

A hardened steel knitting needle ground at the end to a fine point makes an excellent scriber.



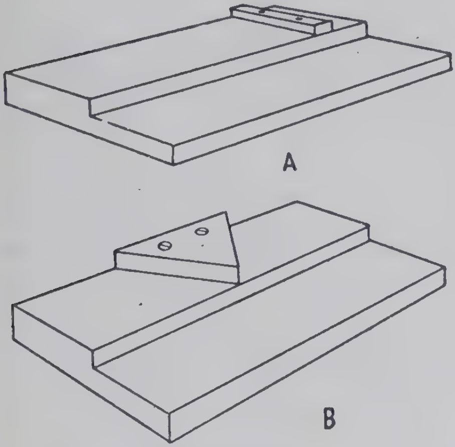
Metal Cutting Shears

Shears, Metal Cutting.—A pair of hand shears, such as that illustrated above, is useful for cutting sheet metal. The action is similar to that of a pair of scissors, but they are very much stronger and have plain handles.

A pair of straight tinman's snips, 8 in. long, is a handy size to have in the tool kit.

Shooting Boards.—Two useful planing accessories are illustrated at

A and B below. The former is an ordinary shooting board, and is used for shooting or trimming the edges of wood, while the latter, called a mitre shooting board, is handy for finishing off mitres.



Shooting Boards

In using the ordinary shooting board, the work is placed so that its edge projects slightly beyond that of the top board and is held tightly against the stop with one hand while the plane is operated on its side with the other.

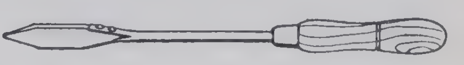
A similar procedure is followed with the mitre shooting board. To prevent these from slipping on the bench, the end butts against the bench-stop.

Soldering, Soft.—Soft soldering is a simple method of uniting such metals as brass, copper, tinplate and zinc by means of an alloy of lead and tin made molten by a copper soldering bit or a blow-pipe, as shown at A in Fig. 1. The tools for simple soldering comprise a soldering bit, a heater, a file and sometimes a pair of pliers. In addition, a flux is needed to prevent oxidization of the surfaces to be joined, a piece of emery cloth for cleaning the surfaces and a supply of solder, obtainable in sticks.

Soldering comprises several simple operations. The first consists of preparing the work by thoroughly cleaning the parts to be joined, as solder will not adhere to dirty surfaces. This operation is important and requires the use of either a file or emery cloth or both. The next consists of tinning the bit, which is accomplished by heating the pointed end of the copper to a full black heat, not red heat, and rubbing the nose on a blob of solder and flux placed on a piece of clean tin-plate.

Then follows the fluxing process which consists of applying a suitable ready-made flux to the surfaces to be joined.

The final operation is to apply the solder with the aid of the heated bit. Before applying the tool to the work, insert the end of the nose in the flux for a moment to clean it, and then melt a little solder by applying it to the bit.



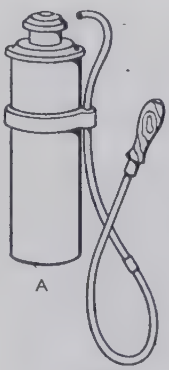


Fig 1.

If the work is small, apply the bit to the work and hold it there until the metal has become sufficiently hot to enable the solder to run.

In soldering seams, it is a good plan to tack the two parts together at the ends and then to draw the hot bit along the seams, feeding the bit with solder from a stick held in the left hand as the work proceeds.

When soldering zinc, use a flux of spirits of salts (hydrochloric acid) and wash the parts directly after soldering.

Killed spirit made by adding zinc cuttings to spirits of salts and allowing the zinc to dissolve is a good flux for brass, while powdered resin or sal ammoniac may be used for copper.

Fig. 2 shows a soldering bit in use, while Fig. 3 illustrates the method of using a small methylated spirit blowlamp for soldering.

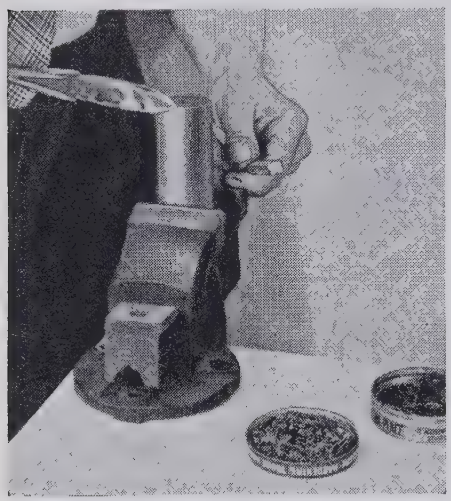


Fig. 2

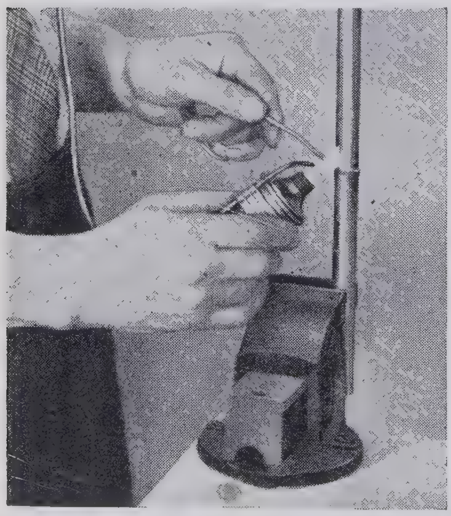


Fig. 3

Spanners and Wrenches.—Spanners are used for tightening or loosening nuts. The ordinary double-ended spanner is shown at A in Fig. 1.

The box or tubular spanner seen at B is for dealing with nuts in corners and places where an ordinary spanner cannot be used. It is turned by a rod passing through holes in the body or shank.

An adjustable spanner, as shown at C, is useful for turning small nuts, and is handy for making cycle adjustments and for turning coach screws in wood.

A pair of grips, known as a footprint wrench, is used for gasfitting, gripping electrical conduits, iron water pipes and the like is depicted at D.

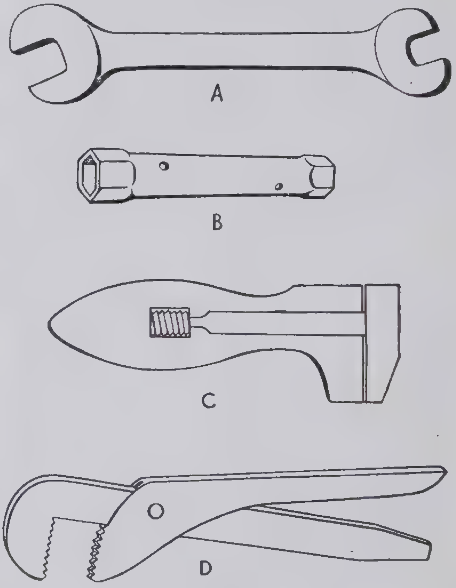


Fig. 1

In using a spanner, see that the jaws fit the nuts; a loosely fitting spanner will ruin the edges of the nut and may slip off and damage the hand.

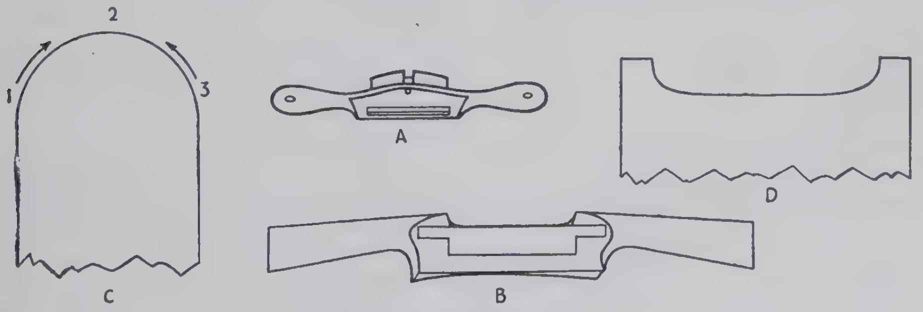
Spirit Levels.—A spirit level is necessary when a true level has to be ascertained as, for example, when fitting shelves in woodwork, levelling ground for concrete foundations or for brickwork in the building of walls. It consists of a sealed tube nearly filled with tinted methylated spirit, set in a perfectly true block of wood or metal.

A slot in the top plate exposes a short length of tube and allows a small bubble to be seen. Level is attained when the centre of the bubble coincides with a centre mark on the top plate.

Spirit levels can be had in various shapes and sizes ranging from about 3 in. to 4 ft. The instrument shown at A is a combined plumb and level, having two tubes. The vertical one near the end is for testing verticality. Such a level, 12 in. long, is the type which will answer most amateurs' requirements.

The illustration at B shows the method of using a level when levelling between two pegs driven into the ground. The top and bottom edges of the intervening straight-edge must be quite parallel and dead true.

Spokeshaves.—A spokeshave is a woodworking tool of the plane category, used for smoothing the edges of curved work. The figure shows two kinds of spokeshave.

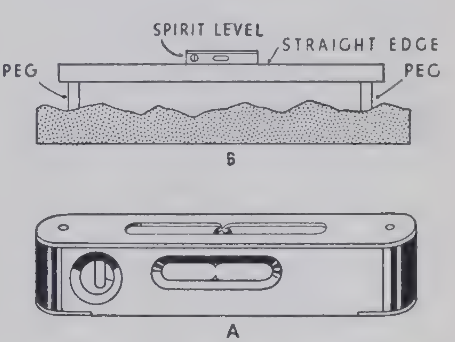


Spokeshaves

That at A is a modern type of tool having a metal stock, while that at B has a wooden one. Both are fitted with an adjustable steel cutter. Owing to the narrow sole of the wooden type it soon wears, a drawback which is eliminated in the metal spokeshave.

The tool is used by gripping the handles with both hands and either drawing or pushing, usually the latter, it along the work in the same direction as the grain.

In smoothing the rounded edge as that shown at C in the figure, use a flat faced tool and work in the direction indicated by the arrows—that is, first from 1 to 2 and then from 3 to 2. A round-faced spokeshave should be used in smoothing a concave surface as at D.

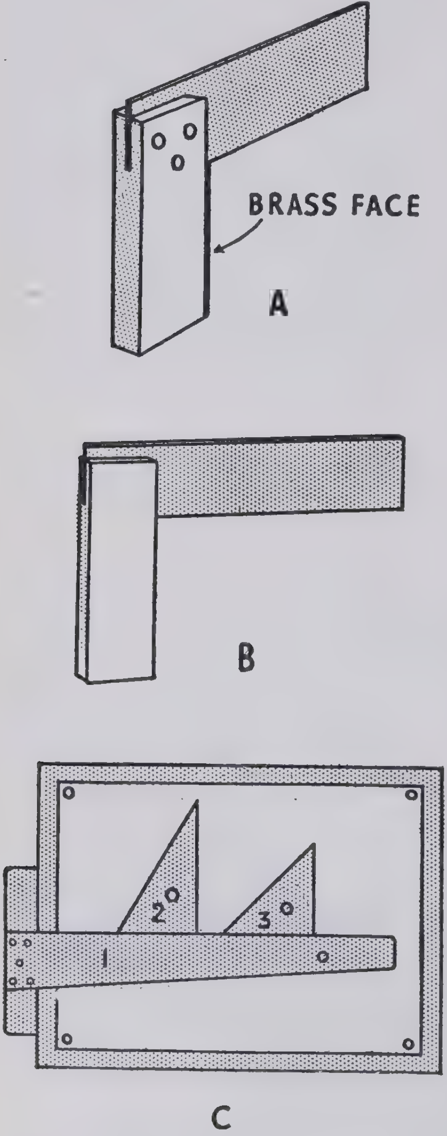


Spirit Levels

Squares.—A woodworker's square is called a try square and this important tool is illustrated at A on page 74. It is used principally for testing the squareness of wood and as a guide for marking lines at right-angles to the edge of the work. Two types are available, one having a wooden stock, the working face of which is faced with brass, and the other is an all-metal tool.

The square shown at B is an all-metal square of extreme accuracy used by engineers. Such a tool is used in the same way as the woodworker's square, but it is, of course, for metal.

A tee-square is a draughtsman's tool. Cheap squares of this description are generally made of pearwood, while those of better quality are constructed of mahogany. The working faces are sometimes faced with ebony to reduce wear. It is used principally as a guide when making or projecting horizontal lines, the stock being held tightly against the left-hand edge of the drawing board. A tee-square is illustrated at c (1).



Squares

The squares (2 and 3) seen in the same illustration are set squares also used by the draughtsman for setting out common angles and as a guide in conjunction with a tee-square for making vertical lines.

Staining Wood.—Staining is a process for colouring wood, either to give it a finish or to give common wood the appearance of a better one. The amateur is well catered for in the way of stains. The cheapest kinds are water stains which may be obtained in powder form and simply mixed with water, or they may be had ready mixed in suitable portions by the maker.

Spirit stains having the pigment or colouring matter dissolved in spirit are more expensive than water stains but they have the great advantage of not raising the grain and do not penetrate the grain very quickly.

Oil stains, in which the colouring matter is mixed with linseed oil and turpentine like spirit stains, do not raise the grain and are useful for colouring porous wood.

In treating finished woodwork of importance, all nail holes and other imperfections should be filled with a suitable stopping. Plaster-of-paris and whiting mixed with a small quantity of water to form a putty is quite suitable. When dry, the surfaces should be glass-papered down perfectly smooth.

Any end-grain surfaces should receive a coat of glue-size to prevent excessive absorption of the stain. If this is omitted these parts will appear darker than the rest of the finished work.

Before staining wood with water

stain, it is advisable to damp the wood all over in order to roughen it. The roughened surface is rubbed down when dry with fine glass-paper, and it is better to repeat the process especially if the wood is soft, as the stain will then have less tendency to raise the grain.

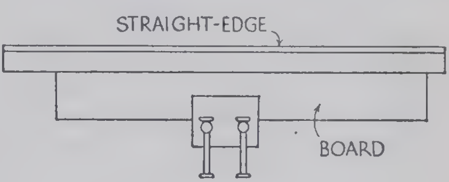
The next process is to fill the pores of the wood with a mixture of plaster-of-paris, whiting and water and, when dry, to glass-paper the surface, rubbing in the direction of the grain.

Apply the stain with a brush, and, when dealing with large surfaces, go over the work afterwards with a rag moistened with stain. Do not put on too much stain. If the shade is not dark enough after the first application apply another after the first one has been allowed to dry thoroughly. Then rub the surfaces with ordinary paper, coat them with thin size, allow to dry and repeat the process, allowing the work to stand for a day or two for the water to evaporate. The work is then ready to receive varnish, wax polish or any other finish desired.

Straight-edge.—An important yet simple tool used principally for testing the truth of wood surfaces. It consists of a strip of hardwood such as well seasoned mahogany which does not twist or warp to any appreciable amount, and has one edge planed perfectly straight. The figure shows a straight-edge in use.

Steel.—Steel is an alloy of iron and carbon and the amount of carbon in its composition determines its hardness. Soft steel, better known as mild steel, has a carbon content of less than 0.5 per cent. and is easy to file, drill and turn. Hard steel, known as high-carbon or tool steel, containing between .75 per cent. and 2 per cent. of carbon, is used for tools and, unlike mild steel, can be hardened or softened. By heating it up to redness and quenching it in water, it becomes extremely hard and brittle while by heating it up, and allowing it to cool very slowly, it is rendered soft. In this condition it is fairly easy to work.

Tools made of high-speed steel, which is an alloy of steel with some other metal such as tungsten or chromium are capable of cutting at a higher speed than an ordinary steel tool.



Straight-edge

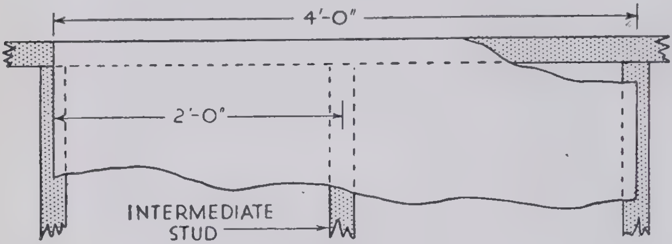
The difference between high-speed steel and carbon steel is easily detected by applying it to an emery wheel. Carbon steel emits bluish-white sparks while the sparks from high-speed steel are minute and of a reddish tint.

Stripwood.—Stripwood is the name given to ready planed strips of hardwood. Such wood is of inestimable value to the amateur cabinet maker, and can be obtained at most dealers. Stripwood is made in a variety of square sections ranging from $\frac{1}{8} \times \frac{1}{8}$ in. to $1\frac{1}{8} \times 1\frac{1}{8}$ in., and rectangular sections from $\frac{1}{4} \times \frac{1}{16}$ in. to $2 \times \frac{7}{8}$ in. This material can be used for all sorts of purposes including framework for doors, panelling, false rebates, and many other things.

Studs, Wooden.—Studs, or studding, is the technical term for the vertical intermediate members of framework such as that used in a lath and plaster partition and similar timber-framed structures.

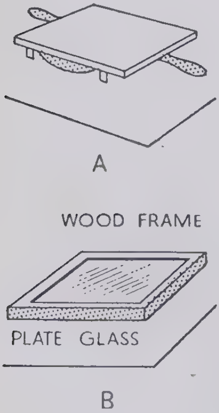
Studs in lath and plaster partitions are usually spaced about 18 in. apart and they can generally be located by the more solid sound when tapped with a hammer.

If asbestos or other sheet material is to be fixed to studded framework, the studs should be so spaced that the edges of adjoining sheets come in the centre of a stud to enable them to be fixed, and a suitable number of studs should be fixed in the intervening space adequately to support the material. Thus, in using ¼ in. thick asbestos sheets 4 ft. wide, one intermediate stud would be sufficient. The illustration above shows the arrangement.



STUDS

Surface Plates.—A surface plate is essentially an engineer's device and consists of a suitably designed cast-iron plate, the upper surface of which is scraped perfectly true. It is used in conjunction with a surface-gauge for marking out purposes, and is also employed for testing the accuracy of small flat surfaces such as a slide valve face of an engine cylinder. A hard scraped surface plate as shown at A in the illustration measuring 9× 6 in. can be bought, though a similar tool, planed only, should be secured if possible. A piece of plate glass fixed in a stout wooden frame as seen at B, however, will generally be quite sufficient for most amateur requirements.



Surface Plates

Surface-gauge.—A surface-gauge or scribing block, as it is sometimes termed, is used principally in conjunction with a surface plate for marking out machine parts. In its simplest form it consists of a circular cast-iron base, the under-side of which is perfectly flat and square with the post. Sliding on the post is a swivelling clamping device which holds a thin steel scriber in any desired position.

In marking, the work is generally chalked to enable the lines made by the scriber to be seen distinctly.

Taps: Notes on Water and Gas.—It is a punishable offence to allow a water tap to leak indefinitely. A tap that drips when shut off shows that either the soft leather or fibre valve-washer requires renewing or the seating upon which the washer rests needs attention. To replace a tap-washer, proceed in the following manner. If the tap is fed directly from the main, shut off the supply by turning the stop-cock, which may be inside the premises or below ground somewhere outside, generally near the main entrance. When the tap is supplied from a cistern, turn off the stop-cock, usually fitted at the outlet, and drain off the water in the pipe by turning the tap on.

Unscrew the top portion of the tap carrying the spindle. This, in some instances, has a left-hand thread and will therefore have to be turned in the same direction as in tightening up a normal screw-thread.

As cold water taps are usually connected to lead pipes it is as well to support the tap with the other hand when unscrewing, and thus relieve the strain between tap and joint.

The valve, or jumper as it is called, to the underside of which the washer is attached, will be found at the lower end of the spindle, or, if of the loose type, it may be resting on the valve seating. Unscrew the small nut which keeps the washer in place, remove the worn washer and fit another of the same diameter.

While the tap is dissembled, examine the seating. If it is ridged or pitted the seating will need treatment to make it perfectly flat. If only slightly uneven, the surface may be trued by grinding it with emery powder and oil, applying the mixture to the perfectly flat end of a round metal rod and twisting it back and forth with a circular motion. In the event of the seating being badly damaged it will be as well perhaps to take it to the local ironmonger's who will have a special tool for dealing with it.

In re-washering hot water taps always use a fibre washer.

Leaking gas taps are a source of danger and should be looked to as soon as they show signs of looseness. It may be that all that is necessary to stop a leak is to screw up the small screw at the bottom of the plug. On the other hand, the trouble may arise from an ill-fitting plug. This can generally be remedied by the application of a mixture of emery powder and oil and grinding the plug into the socket. Before dismantling the taps, the gas supply must be turned off at the main.

Teak.—Teak, often referred to as Indian oak, is a strong hardwood, the better qualities of which are produced in Burma and Siam, while an inferior kind comes from Java. It is straight-grained and fairly easy to work and does not shrink and warp to any appreciable extent. Teak contains an oil which renders it impervious to woodworm and also prevents corrosion.

Teak is durable, even if alternately wet and dry, and it is for this reason that it is used extensively for garden furniture, window sills, draining boards.

Templates.—Templates are great time savers when it is necessary to mark out several pieces of work of the same design, and can be used with equal effect on wood or metal. Templates are really a solid pattern of the outline of the parts it is desired to make, the edges of the template being used as a guide for marking the work.

Using a template

Templates made either of cardboard or plywood can be used for wood, but tinplate, sheet brass or any sheet metal should be employed for metal.

In preparing a template for curved work, it is a good plan first to draw the pattern on a piece of squared paper then to stick it on the material used for the template and then shape the template accordingly.

The illustration depicts a template for marking out a number of wooden brackets and also shows the method employed in using it with a view to economy of material.

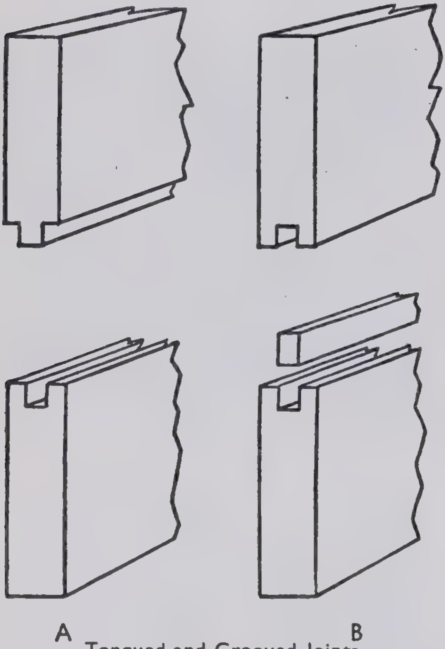
Timber, Selecting. — In selecting timber the following points should be carefully noted. The timber should be

(1) Of bright appearance and should have characteristic odour.

(2) Free from shakes, knots, waney edges and other imperfections and be of uniform colour as any sudden change of colour such as red patches usually denotes some form of decay.

(3) Dry and well seasoned. Unseasoned or green timber is useless for constructional work.

Tin.—Tin is a whitish, expensive metal used principally for mixing with other metals to form alloys. It has a low melting point and is one of the constituents of soft solder. Tin is employed for coating sheets of iron, in which form it is known as tinplate. Tinplate is extensively used for making household articles such as kettles, and commercial articles including boxes and containers.



Tongued and Grooved Joints

Tongued and Grooved Joints.—A tongued and grooved joint is used in fastening a number of boards together to obtain width and greater strength than that given by the plain glued butt-joint. There are several types of such joints, two of which will be seen in the figure. The one shown at A is made by planing one edge of a board to form a tongue and the corresponding edge of the next board is grooved to receive it.

That shown at B requires a groove in adjacent edges the loose tongue being a strip of wood of the same thickness as the width of the groove. Where an extra strong joint is required the tongue can be formed with a number of pieces cut across the grain, or plywood could be used.

In making tongued and grooved joints, it is essential first carefully to plane the face sides and then accurately to mark and prepare the edges. Very hot glue should be used in gluing up, and the work should be cramped after gluing.

Varnishing Wood.—Varnish imparts a hard glossy and washable surface on both bare and painted wood, but before an attempt to apply it is made by a novice the following points should be noted.

Varnishes may be classified under two headings: those composed of various resins such as copal, shellac and others dissolved in methylated spirit, turpentine and volatile oils. The former, although they take longer to harden than the latter, should always be used for high-class work.

Spirit varnishes are generally confined to common work and they have the disadvantage that, when hard, they are extremely brittle and, if accidently scratched, produce a definite white mark.

Oil varnishes can be obtained to produce a transparent finish or they can be had in various shades of brown, in qualities suitable for inside work and for work exposed to the weather.

Before applying varnish, bare wood should be glass-papered thoroughly to produce a perfect finish as any number of coats will not hide defects but tend to emphasise them. The same applies to painted woodwork. In dealing with old paint, all gloss should be entirely removed with glass-paper and dusted thoroughly. Newly-painted surfaces must be absolutely dry before varnishing.

Use a special varnish brush; the bristles of an ordinary paint brush are generally too stiff for varnishing. See that the brush is free from dust as this is fatal to successful varnishing. This applies equally to the room in which the varnishing is to be done. Also do not attempt to varnish if the temperature is below 60 deg. F.

Having prepared the surface to be treated, flow the varnish on, not too much and not too little, and see that the entire surface is perfectly covered before the varnish starts to harden; an unsightly patch is likely to result if touched up afterwards. Do not over load the brush as this is conducive to the formation of "tears" on the wood. If properly done, the finished surface should be quite smooth and devoid of brush marks.

If it is desirable to give the work a further coat, the first one should be allowed to harden for at least a week. The surface should then be rubbed down quite smooth to remove the gloss with very fine pumice powder applied with a moist felt pad. The prepared surface should then be wiped with a perfectly clean sponge and clean water and allowed twenty-four hours to dry. The final coat can then be applied.

Vices, Wood and Metal Workers'—Vices for gripping and supporting work are indispensable items in the equipment of the woodworker as well as the metalworker. Fig. 1 shows three handy types of vices for holding wood. That shown at A, fitted with two wooden screws, is a cheap type suitable only for light woodwork.

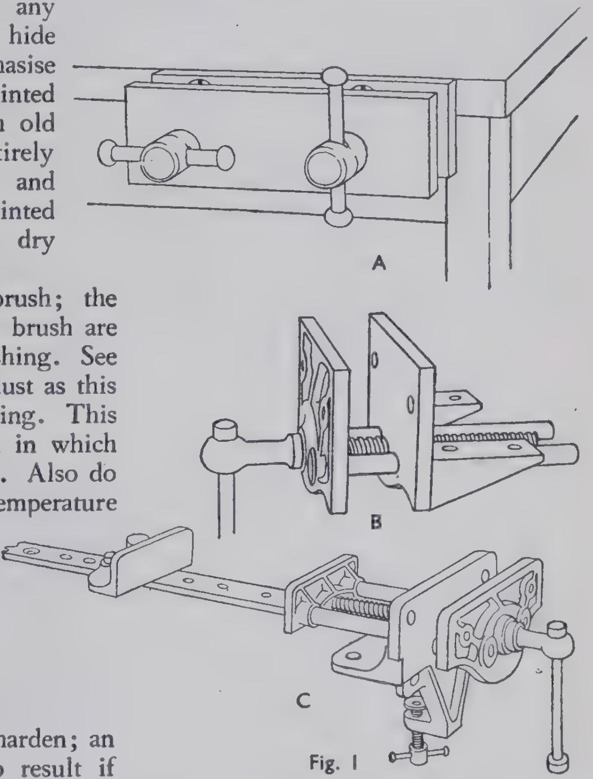


Fig. 1

A better type of vice for general woodwork is that illustrated at B. The vice is of iron and the advantage of such a tool is that even after being subjected to rough usage and hard wear the jaws remain parallel, a feature not attained in the old-fashioned vices of the wooden-screw type. A vice of this description having 6 in. jaws which open to 4½ in. will handle most jobs.

Before use, the inside faces of the

jaws must be fitted with wood, preferably hardwood, which is held in position by countersunk-headed screws driven through holes provided for the purpose.

In fitting the facings it is advisable to fasten the wood so that the grain runs vertically, and it is recommended that the top ends project a trifle above the top of the jaws, especially if the worker is inexperienced.

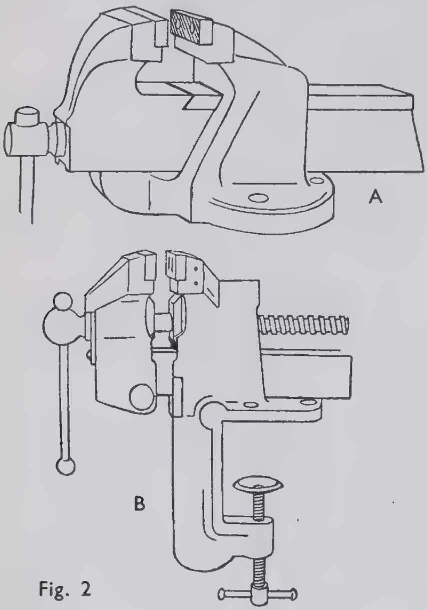


Fig. 2

To keep the vice in good order, an occasional drop of oil on the screw and guides is all that is necessary.

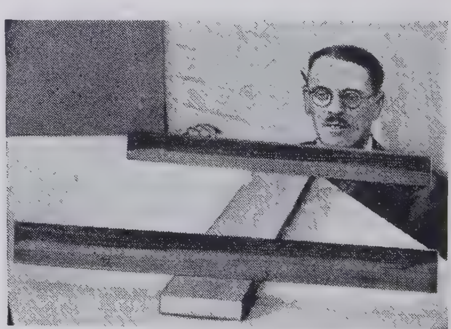
Another inexpensive vice is shown at C. This patent vice combines a cramp.

Metalworkers' vices are of a different construction from those used by woodworkers, as Fig. 2 shows. That illustrated at A is the type generally favoured by the expert craftsman, while that at B is a patent table vice having jaws 2½ in. wide that open 2½ in.

Such a vice is the best for model engineers, wireless fans, amateur electricians and others where a means of holding small work is a necessity.

Winding Strips.—Winding strips are used in conjunction with the straightedge in the preparation of timber for joinery as a test for accuracy when forming plane surfaces. They can be made of two pieces of straight grained mahogany about 2 ft. in length, 2 in. wide and ½ in. thick. The long edges must be planed quite parallel and it is advisable to chamfer the top edges. They are placed across the wood to be tested, near each end, and then sighted over the tops. If the surface of the work is true, the two edges of the strips will appear to coincide. In the event of the surface of the work being twisted or in winding the edges of the winding strips will not lie in the same plane.

The illustration shows the method of using the strips.



Winding Strips

Workshop.—An outside structure is better than an attic or spare room where sawdust and shavings are likely to upset the general cleanliness of the house.

In constructing such a building, it is wise to make it of sufficient size at the outset as it is a nuisance to work in cramped space. A workshop about 10 ft. long by 7 ft. wide is large enough, but a couple of feet longer would be better.

Before constructing a workshop, one or two points must be considered. The question of whether to make it a permanent or a portable structure must be decided. A portable building is as simple to construct as a permanent one and adds little to the cost of making. Another query to be settled is whether to have a boarded or a concrete floor. The latter is better but more expensive, while a boarded floor is quite suitable provided tongued and grooved boards are used and kept at least 9 in. above the ground level to allow air to circulate and ensure dryness.

A structure walled with asbestos-cement sheets and roofed with the same material has the advantage of being heat-resisting and weatherproof. Galvanised iron, unless insulated with boards, is hot during summer and cold in winter, and the boarding adds considerably to the cost.

Tongued and grooved V matching is suitable for cladding the walls provided it is sufficiently thick. Nothing less than $\frac{5}{8}$ in. (finished) should be employed, and the joints should be arranged vertically.

The question of light is important. To obtain the maximum amount of light, it is advisable to make a window extending the whole length of the workshop and to fix an opening skylight towards the front of the roof.

Electric light, if available, is the safest artificial illuminant and, if installed in the house, it is not a difficult matter to run wires. In districts where neither gas nor electricity is available, a paraffin-gas lamp of good make will satisfy requirements.

The bench should be fixed as close as possible to the front walls and under the window, and cupboards and shelves should be provided for the convenient housing of tools and materials.

Wrought Iron.—Wrought iron is a greyish metal made from cast iron from which all impurities have been extracted. It is tenacious, soft, easy to file, turn and drill and can be welded and forged. Obtainable in sheets and bars, it is used largely in ornamental work such as gates.

Walnut.—This admirable hardwood, of which there are several varieties, is a favourite for cabinet making. American walnut, produced in eastern North America is of a dark brown colour and is hard, tough, strong and straighter in grain than that obtained in Europe. It takes a high polish. A lighter coloured wood also imported from America has a straighter grain and is used largely for manufacturing furniture.

Satin walnut is of a light reddish-brown colour, soft, fairly tough, but liable to warp and twist.

Weather Boards.—Weather boards are useful for cladding sheds and other outside structures. There are several types of board to be had, which are wedge shaped in the section the cheapest having plain edges. Weather boards are fixed horizontally, the wide edge of the upper board overlapping the narrow edge of the lower one, and it is usual to start fixing from the bottom of a framework and work upwards.

Rebated weather boards are a little more expensive than plain ones and have a rebate in the wide edge which allows the corresponding narrow edge of the board to lie flush with the frame.

Zinc.—Pure zinc is a bluish-white element of lustrous surface. It is used extensively in alloys such as brass, which is an alloy of copper and zinc. Zinc is also employed in galvanising iron. The iron is immersed in a bath of molten zinc leaving a protective coat which protects the iron from rust and corrosion.

Sheet zinc is useful for making roofing, kitchen utensils and lining the interiors of cases.

It is soft, easy to work and can be soft soldered.

WOOD TURNING

THE practice of wood-turning consists essentially of revolving pieces of wood at a high speed in a lathe and shaping the material while spinning with suitable cutting tools.

The wood is fixed into the lathe and is made to revolve quickly by a belt passing over a pulley. As the wood spins round, a sharp cutting tool held in a proper manner against the material removes the waste wood.

The lathe required for simple wood-turning is not complicated; it is in fact extremely simple. The power required to drive it is obtained from a treadle.

Parts of the Lathe.—Fig. 1 shows a simple lathe suitable for the purpose. The machine consists of the following principal parts: The bed, sometimes constructed of wood, which is mounted upon the stand and legs, A; the headstock, B; the tee-rest, C; the tailstock, D.

The headstock is fixed down to the bed and consists of a coned-stepped pulley, over which the driving belt runs, mounted on a shaft or spindle and suspended between two bearings.

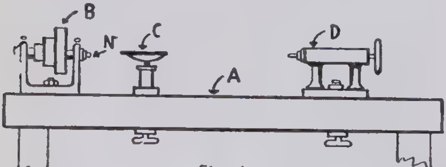


Fig. 1

A spur-centre as illustrated at A in Fig. 2 is screwed into the nose of the spindle (N in Fig. 1) which digs into the wood and holds it firmly in position when the lathe is in use.

The tee-rest, so called because it resembles the letter T, is used for keeping the cutting tools in position. This rest has two adjustments, one of which allows it to be moved along the bed of the lathe and to be clamped down in a suitable position, and the other allows the height of the rest to be altered at will to suit the height of the tool used on the work.

The tailstock is fixed to the opposite end to the headstock on the lathe bed and carries the back centre which consists of a short sharp-pointed piece of hard steel. Like the tee-rest the tailstock can be moved along the bed and clamped down.

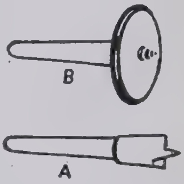


Fig. 2

A screwed spindle which runs through the body of the tailstock allows a further adjustment to be made to the back centre, the latter being housed in the end of the spindle.

Power is transmitted to the coned pulley on the headstock by the belt through the medium of a treadle driving wheel and connecting rod, all of which are contained in the stand of the lathe.

Turning Tools.—The principal tools required for simple wood-turning are gouges and chisels. These are, of course, different from those used in carpentry and joinery.

Fig. 3 shows both these tools. You will notice that they are longer than those used by the carpenter, and that the cutting edge of the gouge is more or less rounded instead of being straight across. This curvature allows only one edge at a time to cut.

The cutting edge of the chisel slants, the reason for this being that as only a portion of the cutting edge is used, it allows the tool to be held at the correct angle and prevents the point of the tool from digging in the work. The cutting edge is also bevelled on both sides which enables the chisel to be used in either direction.

The best woods for turning are hard woods such as beech, mahogany and oak, as they are easier to work than soft woods like pine and deal.

You should practise with hard woods until you have learned how to handle the tools properly and can turn out fair work before attempting to work with soft woods.

A Preliminary Experiment.—A good thing to make for a start, and one which will enable you to get the feel of wood-turning tools, is a plain wooden cylinder.

Get a piece of hard wood, round or square in section and a trifle larger than the required finished size of the cylinder. Saw the ends so that they are square and find the centre of each.

Now make a saw cut as indicated in Fig. 4, about $\frac{1}{8}$ in. or so deep, across one end and in the centre, to allow the prong to sink well into the wood. This is necessary for driving purposes. Next, make a small centre hole about $\frac{1}{8}$ in. deep at the opposite end, using a centre punch for the purpose, and trim off the long edges of the wood with a chisel or plane as shown in Fig. 5.

Place the slotted end of the wood against the points of the prong chuck (A in Fig. 2), so that the prongs enter the cut and be careful to see that the centre point of the chuck comes in the exact centre of the wood. Drive the wood well home with a mallet.

When you have put a drop of oil on the point of the back centre and fed the centre up to the work so that the point enters and is fairly tight in the hole provided, the chucking process, as it is termed, is complete.

The next thing to do is to adjust the tee-rest so that the top is slightly lower than the centre of the work and far enough back from the work to give a clearance of not more than $\frac{1}{4}$ in.

Now start spinning the work round by working your foot up and down on the treadle. When the work is revolving at a fairly high speed in a direction towards you, you are ready to commence operations.

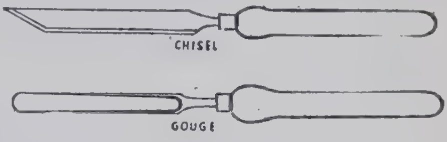


Fig. 3

Roughing Out.—Hold the handle of the gouge firmly with the right hand, keeping the knuckles downwards and the concave or hollow surface of the tool to the top. With your left hand, grasp the tool near its cutting edge and bring it to rest on the top of the tee-rest, keeping the cutting edge tilted a trifle upwards.

Push the gouge gently forward towards the work until the cutting edge begins to remove the waste in the manner shown in Fig. 6, then slide the gouge steadily along the rest for a short distance, being careful that you do not push the tool forward in so doing. When you have traversed the tool along the work for about an inch or so, make a little deeper cut by pushing the gouge slightly forward and then move it back along the work.

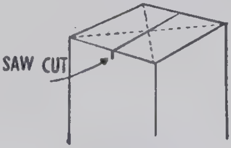


Fig. 4

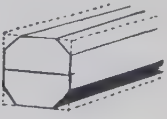


Fig. 5

Repeat this process until sufficient material has been removed all along the work, and its size is reduced to a diameter slightly larger than the finished size.

This completes the roughing out. Finishing consists of smoothing the uneven surface resulting from the roughing out.

To produce a smooth surface, turn the gouge slightly on its side to bring one cutting edge against the work, and take a slight skim along the material.

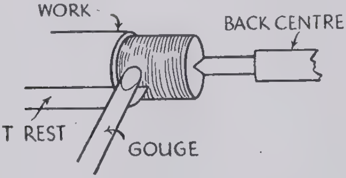


Fig. 6

If the resulting surface is not quite as smooth as you desire, take the chisel—which is held in practically the same way as the gouge, except that it should be tilted so that only the middle portion of the cutting edge touches the work—and traverse the tool along the work, reversing the chisel with each alteration in direction of traverse.

An excellent surface may be obtained by holding a piece of fine glass-paper against the work while it is revolving.

A Warning.—A very important point which you should carefully observe when using the chisel is to see that the point of the tool is not allowed to come in contact with the work, otherwise the point will dig in and probably ruin it, to say nothing of minor injuries inflicted on the operator.

The gouge is not only useful for turning the outside surface of wood, but can also be used for hollowing out such things as egg-cups or wooden bowls.

In this case the gouge is held in position with its face downwards.

To hollow out a piece of wood you must first of all screw the material on to a taper screw chuck as that illustrated at B in Fig. 2, and then work from the centre, gradually raising the cutting point of the tool above the centre until the desired diameter of the recess is cut out.

By repeating the process it is possible to get the correct depth of hole.

If the work is a circular box or an article of similar nature, where the inner corners are usually square, the chisel can be used to remove the small amount of waste left in by the gouge, owing to the rounded shape of its cutting edge.

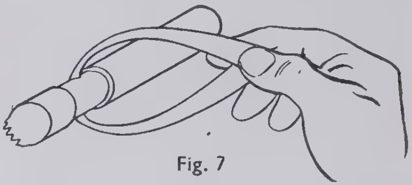


Fig. 7

When you wish to turn a piece of wood down to a definite size, you should use a pair of callipers for measuring. This operation is shown in Fig. 7.

VENEERING

THE quality of the ground-work upon which the veneer is applied is important. Resinous and knotty woods should not be used. Such woods are prone to unequal shrinkage and cause blisters and other imperfections. Yellow pine, whitewood and most straight grained woods make good foundations for veneer. Plywood and laminated boards are excellent as they are not liable to shrink and split.

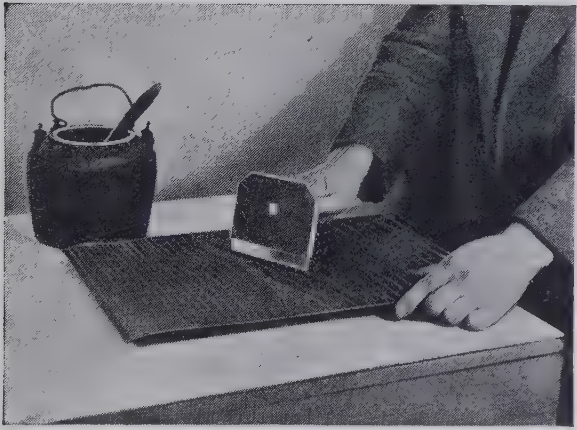


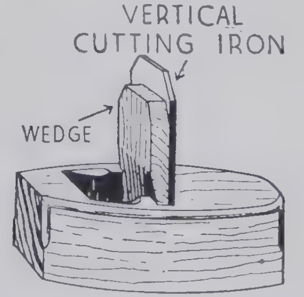
Fig. 1

Veneers are either saw-cut or knife-cut. The former is thicker and therefore more expensive and has a rougher surface than the latter, while knife-cut veneer is smooth and easier for the amateur to manipulate. Some knife-cut veneers are not much thicker than stout brown paper.

Different Methods.—There are two methods of hand veneering. One involves the use of a caul which is a perfectly flat block of wood. This block is heated and then cramped down to press the veneer to the groundwork and squeeze out superfluous glue. The other method, known as hammer veneering, necessitates the use of a tool of special shape called a veneering hammer, as shown in Fig. 1.

To make the tool, procure a piece of hardwood 4½ in. long × 3½ in. wide and ½ in. thick for the stock and a strip of brass 4¼ in. in length × 1 in. wide and $\frac{3}{32}$ in. thick for the blade. Saw off the top corners of the wood, cut a slot ½ in. deep and $\frac{3}{32}$ in. wide in the lower narrow face and bore a ½ in. hole for taking the end of the handle. File off the sharp edges of the metal and drill a hole 1 in. from each end, large enough to clear a thin wood screw. Insert the blade into the slot in the stock and fix it with screws driven through the holes provided. Then prepare a handle about 4 in. long and glue it into the hole already prepared to receive it.

As hammer veneering is the process more likely to appeal to the amateur, owing to its simplicity, a simple piece of work by this method will be described step by step.

Fig. 2


In addition to the veneering hammer, a heavy domestic iron, toothing plane, straight-edge, rule, sharp wood-chisel, glue, hot water and a clean rag will be required, together with a supply of knife-cut veneer and a suitable groundwork.

The toothing plane (Fig. 2) referred to is similar in shape to an ordinary smoothing plane. It is fitted with a cutting iron, held vertically in the stock, while the back of the iron has a number of fine grooves which produce a serrated cutting edge, their object being to produce a slightly rough surface on the groundwork, and to remove any marks left by the previous planing. If such a tool is not available, a piece of coarse glass-paper, wrapped round a block of wood makes a good substitute.

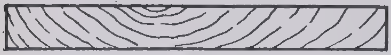


Fig. 3

First Steps.—The first thing to do is to prepare the groundwork. If this is of soft wood, such as yellow pine, examine the end grain, as the veneer should be placed on the heart side, as indicated in Fig. 3. Cut out any knots to a depth of at least $\frac{3}{16}$ in. and fill the recess by gluing in a piece of sound wood cut diamond-shaped if possible as this will hold the glue better than a square piece. This is illustrated in Fig. 4. Smooth the inlay down level and fill in any inequalities with a mixture of glue and plaster-of-paris. This treatment of knots is essential, otherwise blisters will occur at these points and spoil the work.

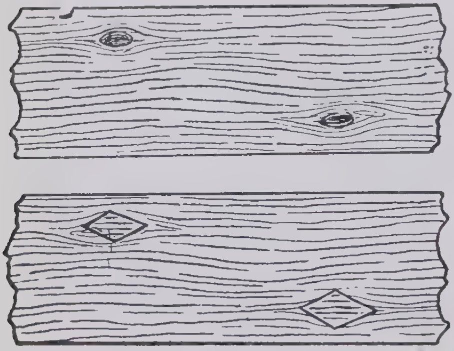


Fig. 4

Then apply the toothing plane or the glass-paper block as the case may be. In using a toothing plane, work it diagonally across the groundwork, first in one direction and then in the other. Remove all dust and brush some size composed of glue thinned with water over the entire surface to stop up the pores in the wood. Allow the work to dry.

Cut the veneer about $\frac{1}{2}$ in. wider and longer than the groundwork. Do not attempt to use a saw for cutting otherwise the veneer will break, but use a very sharp chisel and a straight-edge as a guide, in the manner shown in Fig. 5. Take great care in the cutting, as the veneer is very brittle and liable to break.

Preparing Glue.—Now prepare the glue. This must be free from lumps and perfectly clean. Bring the glue nearly to the boil and test it by dipping the brush into the pot. If the glue trickles off the brush in a continuous stream it is ready.

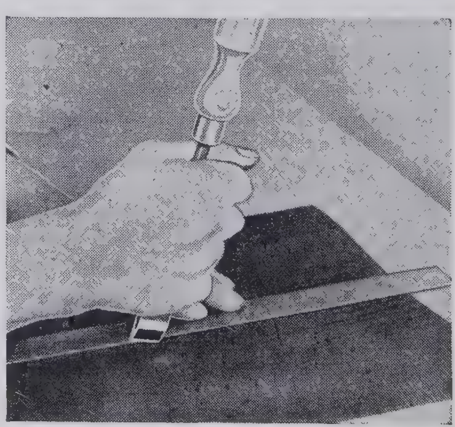


Fig. 5

Before placing the prepared ground on a flat surface such as a bench top, drive a couple of thin nails minus their heads partially into the bench, allowing the pointed ends to project about $\frac{1}{16}$ in. above the surface and place the work over the nail heads to prevent it from slipping when using the veneering hammer, as considerable pressure is needed when manipulating the tool.

Place the flat iron on a gas ring and heat it so that, when held a few inches from the back of the hand, it feels comfortably warm and no more. An extremely hot iron will probably scorch the veneer, while one insufficiently heated is useless.

Examine the veneer to see which side should be placed uppermost. Minute projections will be noticed on one side, corresponding depressions on the other. The veneer should be laid with the projections to the top so that they can be removed during the cleaning process.

Apply a thin coating of glue to the groundwork and the veneer and place the latter in position. Damp the surface of the veneer with a cloth moistened with warm water and at the same time brush a little glue here and there to seal the pores and so prevent the water from soaking through the veneer and reaching the glue underneath.

Ironing.—The next procedure is to apply the hot iron as if ironing clothes. The object of the process is to keep the glue in a melted condition so that it can easily be squeezed out with the hammer. Fig. 6 shows the method.

Now grasp the hammer as indicated in Fig. 1, apply pressure and work it in a zig-zag fashion from the centre towards the edge, taking care not to press on the overlapping part. This presses out the glue, which may be removed with a damp cloth.

Now tap the surface with the fingernails. If it feels solid, all is well. A hollow feeling, however, means that the veneer has not adhered to the groundwork at that point. If such is the case, apply heat with the iron and go over the work again with the hammer.

Turn the work face downwards on a flat surface and trim off the surplus veneer at the edges, using a sharp chisel.

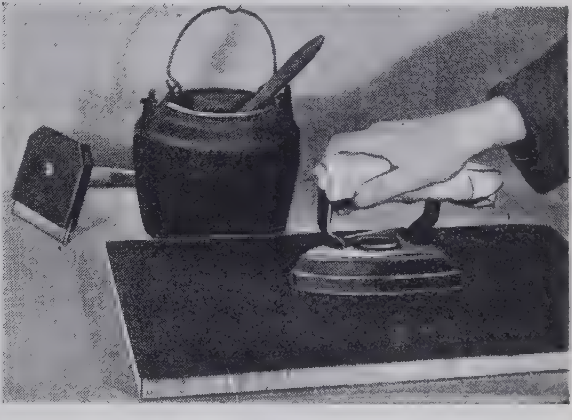


Fig. 6

Allow the glue to dry for at least twenty-four hours—the longer the better—then test the surface again. If a blister shows, make an incision in the centre with a sharp penknife in the direction of the grain, as indicated in Fig. 7, to release the air. Then apply the hot iron and hammer, and glue a thinnish piece of paper over the cut to prevent it from opening as the glue dries.

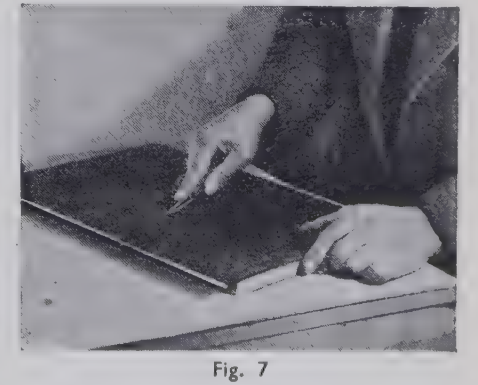


Fig. 7

If the piece of work happens to be, say, a small table-top or the top of a chest of drawers, it is not advisable to veneer the narrow edges, especially those on end grain, as the latter absorb a great deal of glue and make adhesion difficult. In place of veneer, glue and pin a narrow beading of the same kind of wood as the veneer to the edges. If veneering on end grain cannot be avoided, give the ends several applications of glue size and allow each coat to dry before attempting to apply the veneer.

To complete the work, the veneered surface should be levelled with a scraper or a piece of glass, and then smoothed with fine glass-paper, rubbed in the direction of the grain.

Large Veneers.—When veneering a comparatively large surface it may be easier to use two pieces of veneer instead of a single sheet. This means that a joint will have to be made. To do this, fix the first sheet of veneer as already described and then lay the second sheet so that it overlaps by about 1 in. where the joint is to be. With a very sharp chisel, preferably of the paring type, and a straight-edge as a guide, sever the two thicknesses of veneer at the centre of the overlap by taking several light cuts and then removing the unwanted pieces. Then use the hot iron and hammer on both pieces forming the joint, and stick a length of paper along the joint as indicated in Fig. 8 to prevent it from opening as the glue sets.

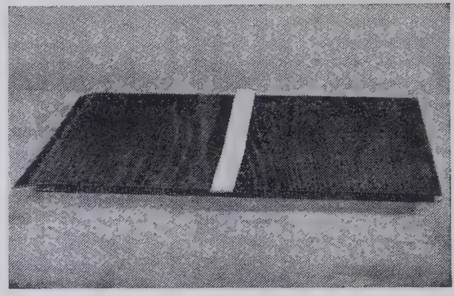


Fig. 8

Do not attempt to cover pronounced joints such as ordinary dovetails with thin veneer as they are bound to show through in time. If less obtrusive joints cannot be employed in making the carcase, thick veneer should be used.

WOOD FINISHING

When finishing wood, you should always endeavour to bring out its character and grain and not disguise the natural beauties which help you to produce a lovely piece of woodwork. The modern methods of wood finishing dealt with here are designed to do this.

Red Deal.—Take any piece, plane it and finish with fine Nos. 2, 1½, 1 and 0 glass-paper. Wipe it with hot water on both sides, leave to dry, then rub again with No. 0 glass-paper. Purchase a small quantity of vandyke brown powder (dry) and a small supply of .880 spirits of ammonia. Mix some of each in the form of a paste and thin out to the required colour with water.

Then, with a brush, put the stain on evenly, working with the grain, wipe off and leave to dry. Now rub with a piece of old calico to take down the grain, and prepare some wet wax in the following manner. Purchase a quarter of a pound of real beeswax and half a pint of turpentine. Melt these together in a tin and add a small piece of resin about the size of a marble. Allow the mixture to get cold and rub it lightly on the deal. Leave for one hour and then polish with a soft cloth.

White Deal.—Plane and finish the wood as described for red deal. Buy a reliable grey dye and mix it in half a pint of hot water and apply with a brush, leave the wood to dry, then rub with hessian, pressing hard and working with the grain. Apply wet wax as before, leave it for an hour and polish with a piece of silk.

The result will be a beautiful purple-grey. (This is now named purple wood.)

Mahogany.—Plane up and finish the wood as usual, but omitting the fine No. 2 glass-paper. Purchase about an ounce of bichromate of potash, mix well in half a pint of boiling water and apply with a brush. When dry, apply raw linseed oil and turpentine (mixed together in equal parts) and wipe off.

The wood should be left for a couple of days in a warm room. Then wet wax it, leave for an hour or so, and polish with coarse canvas. The result will be Chippendale colour without any of the common, unpleasant reddish tone.

Satin Walnut.—This wood, when french polished, is a yellow colour. Treated in the way described here, you get that lovely colour of bronzed satin walnut. Plane and finish the wood. If the article is small, such as a clock case, place it in a box (a packing case will do if you paste up the cracks with paper to make it air tight). Half fill a tea saucer with .880 spirits of ammonia, place it quickly in the box and shut down the lid and paste paper round the edges. Then oil and wax as described before.

Oak.—This wood is so much in fashion that it will be necessary to describe how to obtain all the different effects and colours. Note that Austrian wainscot oak and English oak respond better to the following treatments than American and Japanese varieties.

Weathered Austrian Wainscot Oak.—First wipe over the finished article with hot grey dye (see treatment for white deal) but, in this case, wash off the dye at once with a clean cloth and cold water. Then, when quite dry, rub with canvas and burnish with a chain burnisher. These burnishers are like a small piece of bright chain armour. An old cavalry epaulette will do quite well. Failing this, any piece of smooth bright steel, a flat-iron, the shaft of a screwdriver or the face of a hammer will do. Burnishing takes time and considerable pressure is necessary.

Bleached Austrian Wainscot Oak.—Wash over with hot water in which you have placed some oxalic acid (½ oz. to 1 pint of hot water), then use canvas and burnish as before.

Weathered Oak, Showing Flecks of White in the Grain.—It is best to wipe the finished work first with warm water and castile soap, and when dry, rub down the grain with No. 0 glass-paper and coarse canvas. The best way is to purchase a tin of light oak polish (in the form of a white paste). Apply this across the grain with a soft cloth and polish as you go with a piece of linen or clean calico.

Fumed Austrian Wainscot Oak.—Place the finished work in an air-tight box and fumigate the work as for bronzed satin walnut, but, in this case, do not oil and wax it. Simply burnish it. If a deeper colour is required, it may be oiled and waxed instead of burnishing it. Another shade of brown may be obtained by fumigating and dry-wax polishing. (Chippendale used this method on Cuban mahogany.) The method is simple. Rub a block of real beeswax vigorously with a nail brush. A certain amount of the wax will adhere to the brush. Then rub the wood with the brush. In some cases a piece of coarse canvas is better than a nail brush.

American Whitewood and Basswood.—Proceed in the same way as for red deal or white deal and, if you require a purple-brown, mix the hot dye with the vandyke brown mixture.

American Black Walnut.—This wood is of such a beautiful colour (violet-brown) that it is best merely to rub it with coarse canvas and burnish it.

Silver-grey Sycamore.—See that the wood is clean, then mix hot grey dye and put it on with a clean brush; a painter's sash tool is just the thing. Then quickly wash off with clean warm water, allow the wood to dry, and rub with canvas. Polish with dry beeswax.

Silver-grey Holly.—This colour effect may be obtained in the same way as for silver-grey sycamore, but as holly is only obtainable in small pieces it will be best to use it for small articles such as clock cases or cigarette caskets.

The following hints may be of service:

Burnishing brings out the medullary rays of the wood (oak) as the burnisher slightly takes down the soft fibres.

Oil always intensifies colour. The strength of solutions may be varied according to the shade required.

Always experiment first on a spare piece of wood.

A USEFUL AFTERNOON TEA WAGON

An afternoon tea wagon, shown in Fig. 1, is one of those useful labour-saving devices which can be constructed at little cost by any handyman.

As will be seen by referring to Figs. 2, 3 and 4, this piece of furniture consists of nothing more complicated than a couple of trays supported on four legs fitted with large castors.

Mahogany, walnut or oak may be used for the frame, while plywood $\frac{3}{8}$ in. thick faced to match the wood of the frame can be employed to advantage for the trays.

Materials Required.—To make the fitment the following materials (finished sizes) will be required:

4 legs, each 2 ft. 3 in. long, of wood 1½ in. square section.
2 long rails, 2 ft. long, plus tenon, × 2 in. wide, and $\frac{3}{4}$ in. thick.
2 side rails, 1 ft. 3½ in., plus tenon, in length, 2 in. wide × $\frac{3}{4}$ in. thick.
2 pieces $\frac{3}{8}$ in. faced plywood.
1 set of 4 castors, having 3 in. wheels.
A supply of glue, screws and panel pins.

Start the construction by preparing the legs. The material for these is a stock size and can be obtained ready planed and sandpapered in lengths of 2½ ft.; prime oak costing the most per length; beech and whitewood can be obtained to resemble mahogany and are rather less expensive. The material for the rails also can be had ready prepared in hardwood or oak, the latter being the most expensive.

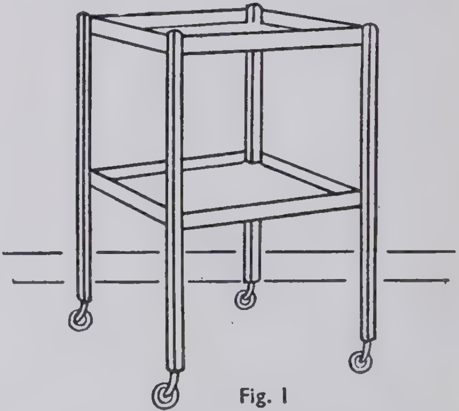


Fig. 1

Mark the legs to true length and set out the positions of the mortices, as mortice and tenon joints are used for joining the rails to the legs. The mortices are cut in two adjacent faces and are $\frac{1}{4}$ in. wide, 1 in. long and $\frac{7}{8}$ in. deep and communicate with each other as the dimensioned, sectional drawing of the joint appearing at A in Fig. 5 shows. The ends of the tenons are mitred as indicated. This joint is exceptionally strong owing to the extra gluing surface at the mitre.

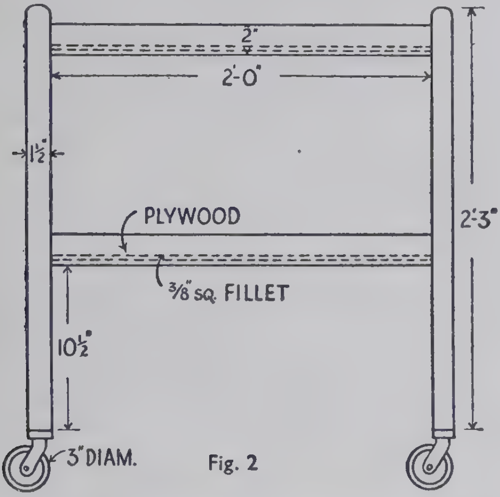


Fig. 2

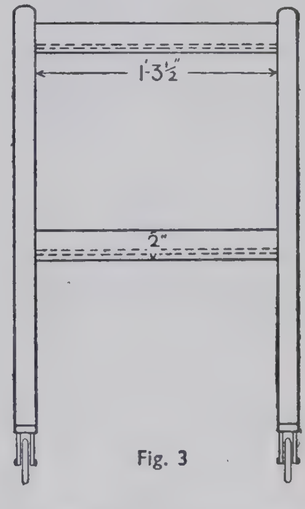


Fig. 3

Having accurately marked the position, the majority of the waste may be taken out with a brace and twist-bit and the remainder removed with a sharp firmer chisel.

This done, mark the rails to length and prepare the tenons. These are $\frac{7}{8}$ in. long, $\frac{1}{4}$ in. thick and 1 in. wide, as illustrated at B in Fig. 5. These are mitred at the ends, as mentioned above and shown in the drawing.

Chamfer the edges of the legs, and, to give them a finish, rounded tops can be formed, if desired. Bore holes at the bottoms to take the shanks of the castors. The latter should be a tight fit in the holes, but they are not fitted permanently at this stage of construction. Then remove the arris, or sharp edges, at the corners.

Now prepare the bottom of the trays. These should be accurately marked and sawn and the edges should be shot so that each piece forms a perfect rectangle. The corners will have to be cut away slightly to allow room for the corners of the legs.

The bottom members are supported on $\frac{3}{8}$ in. square stripwood fillets screwed to the inside faces of the rails, the lower faces of the former being kept flush with the lower edges of the latter. This detail is represented at C in Fig. 5. Brass countersunk-headed screws $\frac{7}{8}$ in. long are advised, especially if the rails are of oak, as iron screws will corrode.

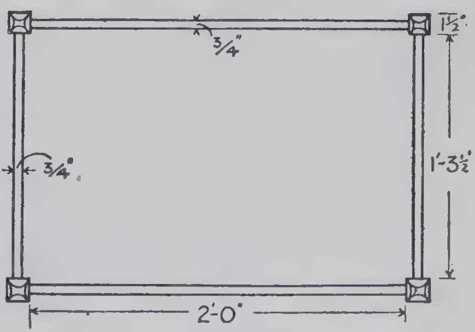


Fig. 4

Gluing the Framework.—Gluing up the carcase is the next process. This is best done by forming the end frames first and then joining the long rails to those members. Place one leg on the floor, applying plenty of glue into the mortice and brush some of the adhesive on the tenon and its shoulder and insert it into the mortice. If necessary, give the free end of the rail several taps with a hammer to ensure that the shoulder butts closely to the leg. Do not strike the bare tenon, however, but use a piece of wood to strike upon, otherwise the tenon will be damaged. Repeat the gluing operation with the lower rail and then fix on the other leg. It is now best to place the unit flat on the floor to enable the frame to be squared up with a try-square. To reinforce the joints, a 1 in. panel pin can be driven through the leg into the tenon. If this is inserted from the inside face it will not show as the end of a long rail will cover the tiny head.

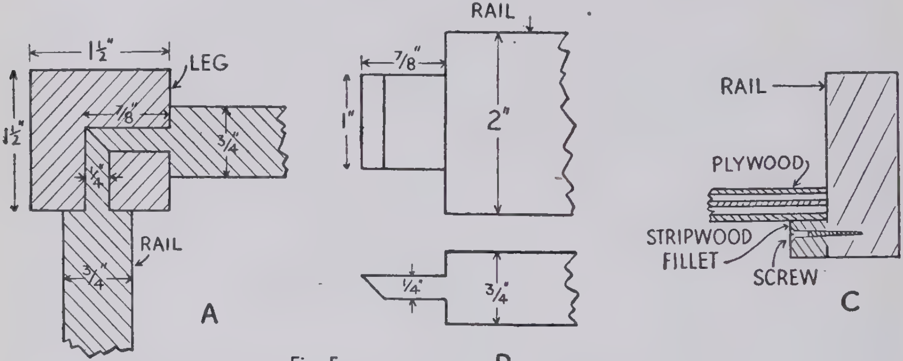


Fig. 5

Assemble the other frame in the same way and then fix the two long rails. See to it that the whole assembly is perfectly square, and allow the glue to harden before fitting the tray-bottoms.

Drill about half a dozen screw-holes spaced at equi-distant intervals $\frac{3}{16}$ in. from the long edges of the plywood tray bottoms and four similar holes at the same distance from the narrow edges. These should be of sufficient size to clear $\frac{3}{4}$ in. No. 5 brass countersunk-headed screws. When the tops of the holes have been countersunk, drive the screws through the bottoms into the fillets.

The whole assembly can now be finished with either stain and dull polish or stain and wax polish according to taste.

The final operation consists of fixing the castors. The holes have already been drilled, so all that remains to do is to insert the shanks and hammer the fixing prongs into the ends of the legs.

If desired, a drawer for holding cutlery could easily be added to the tea wagon. All that is necessary is a neat drawer of similar hardwood to that used for the main construction suspended from two rebated rails fixed on the underside to the lower rails of the fitment. The rebates in the rails can either be formed with a rebate plane or built up to give the same effect. Fillets are screwed to the sides of the drawers at the top which slide in the rebates. The method of doing this is shown diagrammatically at A and B, in Fig. 6.

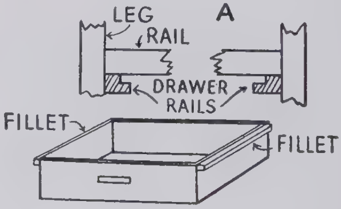


Fig. 6

CIRCULAR SAW BENCH

A SMALL circular saw is an important labour-saving device for the amateur woodworker. With such a machine, ripping, cross-cutting, rebating, grooving and a number of other important operations can be carried out in a fraction of the time taken by hand-operated tools, with less physical exertion and with greater accuracy.

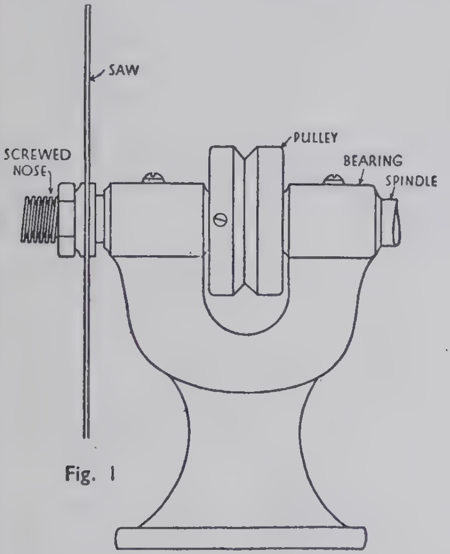


Fig. 1

A circular saw disc, 6 in. in diameter and capable of cutting any of the usual timbers up to 1 in. thick, is illustrated in the drawing appearing at Figs. 1 to 6 and here described.

Machine Details. — The machine consists of a bench carrying the saw, a spindle to which it is attached, and the treadle, driving-wheel, flywheel and crankshaft by which the saw is driven. Upon the top of this bench is a box-like structure forming an upper table which partially encloses the saw, and carries a fence or guide for guiding the wood when being sawn. The table is hinged at the back to the bench-top so that the height of the table can be adjusted to expose less depth of saw—as required, for example, in grooving.

The saw spindle and bearings consist of a small polishing head having a $\frac{5}{8}$ in. diameter shaft screwed at each end as shown in Fig. 1. This device can be obtained at most tool shops though, if you keep your eyes open, you may be able to secure one second-hand.

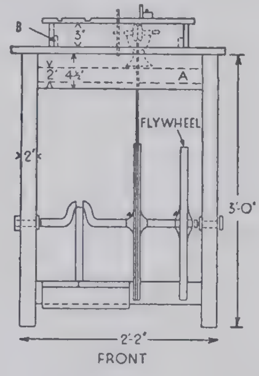


Fig. 2

The crankshaft shown in the drawings was purchased for a small sum from a second-hand machine dealer, as was the 20 in. grooved driving-wheel. The flywheel, a wheel taken from an old mangle, was obtained from a dealer in old iron.

Pivot bearings are used for suspending the crankshaft, and these are simply $\frac{5}{8}$ in. Whitworth bolts with pointed ends that fit into corresponding tapered holes drilled in the ends of the crankshaft. The bolts are $3\frac{1}{2}$ in. long and a nut near the end of each keeps them in position and allows for adjustment.

The treadle consists of two pieces of board kept together by means of battens on the underside, and motion is imparted to the crank by a connecting rod consisting of a piece of flat iron bent at each end to form hooks. The upper hook is attached to the crankshaft and the lower one to a piece of ½ in. iron rod fixed to the underside of the treadle by pieces of thin brass strip bent to the shape of saddles and held in place by screws.

The treadle is hinged to the lower edge of the back bottom nails as shown in Fig. 3.

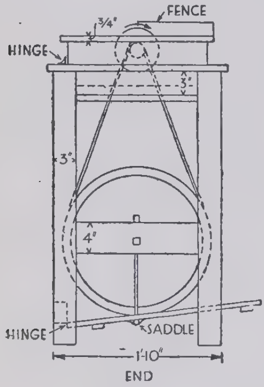


Fig. 3

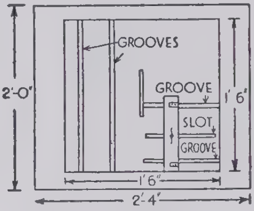


Fig. 4

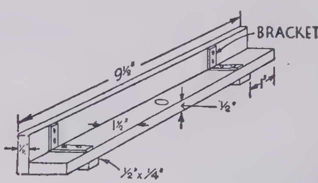


Fig. 5

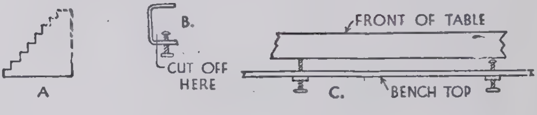


Fig. 6

The Bench.—To make the saw-bench the following material is required. Four pieces of 3×2 in. yellow deal, each a little over 3 ft. long for the legs, two pieces 1 ft. 10 in. long and one 2 ft. long of the same section material for the top side-rails and the bottom back-rail respectively. Three 2 ft. 2 in. lengths of 4½×1 in. are wanted for the top-front, back rails at the top, and the mid-rail shown at A in Fig. 2, and two pieces 4 in. wide ×2 in. thick for the cross-rails which house the bearing bolts, together with sufficient mahogany, oak or other hardwood for the table. This material might be obtained from an old dining-room table. To this must be added sufficient yellow deal for making the bench top and the treadle and a 20 in. length of hardwood for the fence, Fig. 5.

If prepared wood is used, the width and thickness will be slightly smaller than those specified.

Make the bench first by sawing the legs to length and preparing the mortices into which the tenoned ends of the rails fit. The outside faces of all rails should be flush with the outside faces of the legs. Glue the parts together and use wood screws to strengthen the joints. Then cut the mid-rail so that it is a tight fit between the two top side-rails. This member carries the saw spindle and bearings. Do not fix this for the time being. Drill the holes in the lower side rails for the pivot bolts. These holes should be bored accurately and squarely as the crank shaft must be dead in line for true running.

Make the bench top by joining the boards together with 2×1 in. battens screwed to the underside. The battens should be fixed so as to clear a hole about 9 in. square cut in the centre of the bench-top. Do not fix this member at the moment.

The Treadle. — Now make the treadle. This is 2 ft. long and 11 in. wide and is constructed from two boards 5½ in. wide and ¾ in. thick with 2×1 in. cross battens underneath. Screws should be used for fixing these parts together in preference to nails. Make a square hole with the aid of a pad saw in the centre and 9 in. from the back edge to allow the connecting rod to pass through, and fix a 4 in. length of ½ in. diameter iron rod across the centre of the hole. This rod is kept in position by two pieces of brass as indicated in Fig. 3, or, as an alternative, the ends of the rods could be flattened by heating them to redness and hammering them to shape. The flat faces are then drilled to take suitable screws and the rod fixed by means of a screw at each end.

Next construct the top table. This is of hardwood ¾ in. thick.

The sides and ends are 3 in. wide and the joints are glued and screwed butt-joints. The top should be planed quite flat and smooth and two long grooves ½ in. wide × ¼ in. deep cut on the left-hand side of the centre as shown in the plan in Fig. 4. On the right-hand side, two grooves extending from the side edge to the centre must also be made, as well as a slot of the same length as the two grooves. The slot should be ⅜ in. wide to enable a ¼ in. diameter fastening bolt to pass through to hold the fence in position. The bottom projections of the fence, Fig. 5, fit the grooves and keep the fence parallel to the saw. The long channels are for accommodating a cross-cutting device and a jig for cutting mitres. Screws are used for fixing the table top to the sides.

Fig. 5 shows details of the fence. This component consists of two pieces of hardwood each 9½ × 1½ × ½ in. thick. The parts are fixed together by means of screws driven in through the vertical member into the edge of the horizontal one and strengthened by small iron brackets, as shown. The small projecting pieces of wood underneath are ½ in. wide × ¼ in. thick and are also fixed by screws with their heads countersunk.

Now fix the bench-top by means of stout screws driven into the top edges of the top-rails and fasten the table to the bench by hinges at the back as indicated in Fig. 3.

Mounting the Shaft. — Assuming that the mechanical components, including a rawhide or leather belt (the former is recommended) are to hand, place the wheels on the crankshaft and suspend the assembly between the pivot bolts. Give the bearings a drop of oil and make sure that the shaft runs freely without play. This can be ensured by adjusting the bolts. Then place the spindle component, without the saw, in position on the cross member A.

The top of the belt on the small pulley should be as close to the underside of the table-top as possible as the nearer it is the more the saw will project above the top, a desirable feature.

Then mark the position of the ends of the cross-piece on the inside faces of the top side rails and fix the cross-piece by means of stout screws driven in through the rails into the ends of the cross-piece.

It is essential that the faces of the saw disc be parallel with the long edges of the bench top. Lightly nail a strip of wood, whose long edges are parallel, across the aperture to act as a guide. The saw assembly can then be moved along till the teeth at the front and back of the disc just touch the edge of the straight-edge. Having satisfied yourself on this point, fix the saw assembly permanently in position, using screws to suit the holes in the base.

Place the belt over the pulley and driving-wheel and fasten it together with a suitable belt fastener. Rotate the driving-wheel to verify the alignment of the belt. Shift the driving-wheel along the shaft in whatever direction required and tighten the fixing bolt.

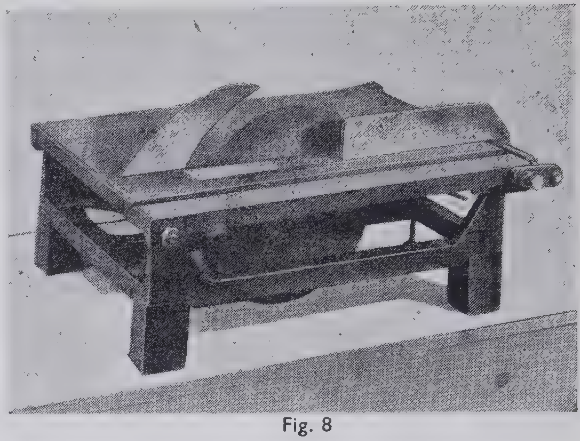


Fig. 8

Couple up the connecting rod, not forgetting to apply oil to each end and also to the spindle bearings. Then drive the saw at a high speed in the direction indicated by the arrow in Fig. 3—that is, towards the operator—and then bring the table very gently down to the saw so that the latter cuts the slot for the saw.

In order to prevent the near end of the table from moving sideways, two blocks of wood should be screwed down to the bench-top so that they lie against the sides of the table as shown at B in Fig. 2.

Adjusting Saw Depth.—The constructor has the choice of two simple methods of providing a means of adjusting the height of the table to enable a smaller depth of saw to be exposed above the surface.

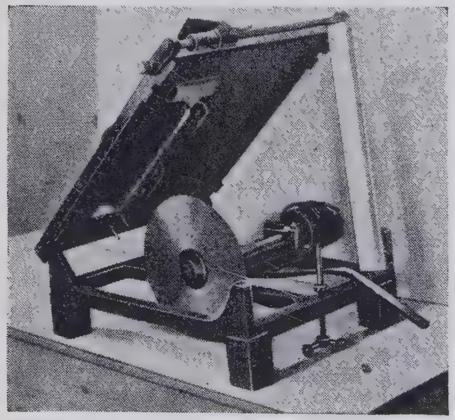


Fig. 7

One way is to prepare a block of wood with a series of steps or ledges on one face, as indicated at A in Fig. 6. This component is placed under the lower front edge of the table so that the edge rests on a step to suit the work in hand.

Another method, and the better, is to provide a screw adjustment whereby absolute accuracy is ensured.

This can be done by lowering the front top rail of the bench for a distance of about 4 in. during the construction of the bench and utilising a couple of cheap screw cramps as indicated in Fig. 6 at B. The legs of each cramp are cut off at the positions indicated and holes are drilled in the remaining piece to enable them to be screwed to the bench-top in position immediately below the lower front edge of the table, as shown at C in Fig. 6. To prevent wear at where the tops of the screws make contact with the edge of the table, sink a piece of brass or other suitable metal into the wood at these points.

Here are a few hints for operating the saw. Always run the saw at as high a speed as possible.

Ripping.—In ripping, set the fence accurately; see that it does not project beyond the centre of the saw and that it is parallel. Do not force the work under the influence of the saw too quickly, but allow the saw to do its job, by feeding the wood gently and evenly as the cutting proceeds. Forcing results in a hot saw and this means a distorted saw.

Circular saws, like hand saws, do not remain sharp for ever. When replacing the saw on the spindle, make sure that it is correctly centred or uneven wear of the teeth will result.

It sometimes happens, when ripping a piece of wood, that the edges of the severed part of the wood at the back of the saw close and tend to project the wood towards the operator.

Those readers who are fortunate enough to have a small electric motor and require a saw for cutting larger and thicker wood cannot do better than construct a circular saw on the lines of the one shown in Figs. 7 and 8.

Such a machine could easily be constructed of wood.

LINEN CUPBOARD

A CUPBOARD for storing linen is best arranged with shelves, so that every item will be visible.

The outer frame is practically a box built up of 1 in. planed deal, 13 in. wide. The shelves and divisions are of the same material, except the top shelf, which is of ¾ in. stuff. The sides extend from the floor to the top, the top being of 1¼ in. stuff projecting over the sides ½ in. and the front 1½ in.

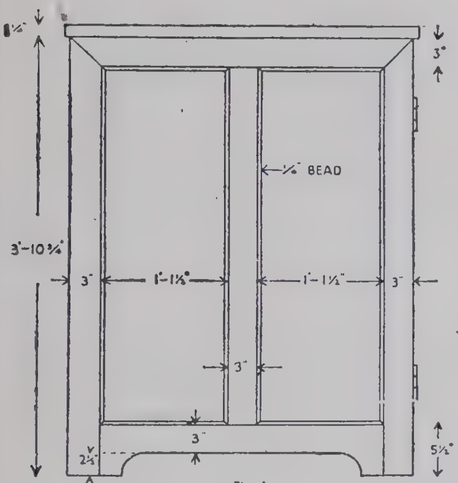


Fig. 1

The sides are housed into grooves in the top board, the grooves extending from the back of the board to 1½ in. from the front. The grooves are ⅜ in. deep and 1 in. wide.

This top board is extended to cover the top of the door and to project ½ in. over the sides so that when the door is closed it overlaps both ends and front by ½ in.

Dimensions.—The bottom of the cupboard is arranged to stand on corners of the side pieces as shown in Fig. 2.

The shelves, of 1 in. wood (except the top one, which is ¾ in.), are also fitted in grooves ⅜ in. deep, again not extending to the front by ½ in., a piece ½ × ⅜ in. being cut off the corners of the shelves to let their front edges come flush with the front edges of the sides. The overall width of the cupboard is 3 ft. The shelves 2 ft. 10¾ in. in length. The bottom board should come 3 in. from the bottom edge of the side members so that the whole of the cupboard does not rest on the floor. The lower ends of the sides are curved as shown at A in Fig. 2.

The bottom drawer is 10 in. deep, so that the first shelf comes at 10 in. from the bottom board (not the floor level). The space above this is divided into three parts by two shelves as shown, and they are 2 ft. 10 in. long and 12½ in. wide. They will then extend back from flush with the front edges of the side pieces to within ½ in. of the extreme back. This leaves room for a backing of either plywood or ½ in. stuff, to be nailed in at the back edges of the shelves, and (in the case of the ½ in. backing) will lie flush with the back. If thin plywood is used it will not come level with the back, but a bead can be planted

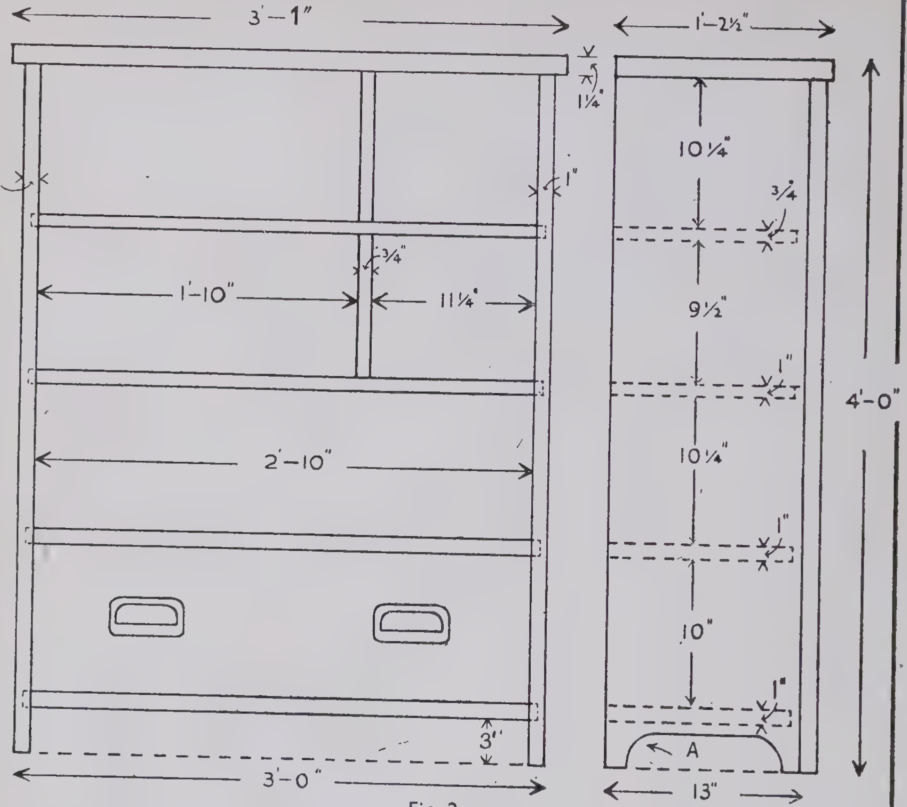

3'–1"
1'–2½"
1¼"
1"
1"
¾"
1'–10"
11¼"
2'–10"
3"
3'–0"
10¼"
¾
9½"
1"
10¼"
1"
10"
1"
A
4'–0"
13"

Fig. 2

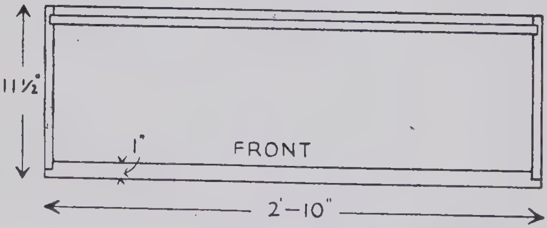

11½"
1"
FRONT
2'–10"

Fig. 3

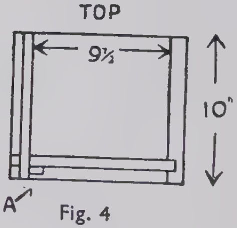


Fig. 4

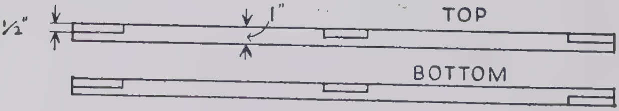

½"
1"
TOP
BOTTOM

Fig. 5

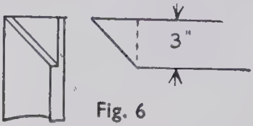


Fig. 6

round the inside to hold the panel up to the line of the shelf-backs and retain it in position.

The Bottom Drawer.—The bottom drawer is shown in Figs. 3 and 4. The front board is of 1 in. stuff, 2 ft. 10 in. long and 10 in. wide. The sides are let into the ends as in Fig. 3, and glued and nailed, the front thus showing no joint. The bottom is of $\frac{3}{16}$ in. plywood, grooved into the sides and front at $\frac{1}{4}$ in. from the lower edges. The back is let into grooves made in the inside faces near the rear ends of the sides and is of $\frac{1}{2}$ in. stuff in a $\frac{1}{2}$ in. groove, Fig. 4. It projects beneath the bottom for a distance of $\frac{1}{8}$ in. and is nailed through into it; a strip A is glued along the underside in the $\frac{1}{4}$ in. space and this is then bradded through the bottom from the underside and through the back into the strip A which is $\frac{1}{4}$ in. deep and $\frac{1}{2}$ in. wide. This is shown in Fig. 4.

The door illustrated at Figs. 1, 5 and 6 is 3 ft. wide and 3 ft. 10$\frac{3}{4}$ in. high.

The framing of the door is made of 1 in. stuff, 3 in. wide. The top corners are halved and mitred as shown in Figs. 5 and 6. The panels are of $\frac{1}{4}$ in. stuff, or two pieces of plywood can be used, one at the back of the other. The panels are of importance in holding the door-frame square, and they should fit exactly into the frame and be held centrally by $\frac{1}{4}$ in. beading glued and bradded into the frame back and front.

The door can be hung on either side by butt hinges let into the faces of the side and the back of the door. A hook catch at the side will secure it.

The front of the drawer can be fitted with two pressed brass, recessed drawer-pulls. Since the front of the drawer comes flush with the front of the side and shelf framing, the door will close up against it and there will be no room for projecting drawer-handles, but if the drawer is made $\frac{1}{4}$ in. less in depth (back to front) then light hinged brass drawer-pulls can be used and room will be provided between them and the back of the door.

There is also a small amount of space represented by the depth of the beading at the back of the door which gives about $\frac{1}{8}$ in. of the room at the back where the drawer-handles come.

The finish can be to taste. It is a good idea to stain the panels a dark shade before building them into the door and to stain the beading, which is used to hold them, a contrasting colour. The rest of the cupboard can be finished with pale shellac varnish, or the whole can be enamelled any shade to choice.

UMBRELLA STAND

THE umbrella stand illustrated in Fig. 1 is of the corner type, measures 2 ft. 6 ins. high with sides 12 in. long.

Details of construction are shown in Fig. 2. Obtain three lengths of 1 in. square oak 2 ft. 9 in. long for the uprights, four 1 ft. lengths of the same material for the side rails and two pieces of oak 1 ft. 6 in. long × 5 in. wide and 1 in. thick from which to cut the curved front rails. A piece of $\frac{1}{4}$ in. plywood will also be needed to support the zinc tray, which is 1 in. deep.

Cut the uprights to length and mark them out for the mortices into which the tenoned ends of the side rails fit. The ends of the curved front rails are not tenoned, but the joints with the uprights are formed with dowel-pins. The position of these should also be marked.

The mortices are $\frac{3}{4}$ in. long, $\frac{3}{8}$ in. wide and $\frac{3}{8}$ in. deep as shown at A in Fig. 2, the tenons the same dimensions.

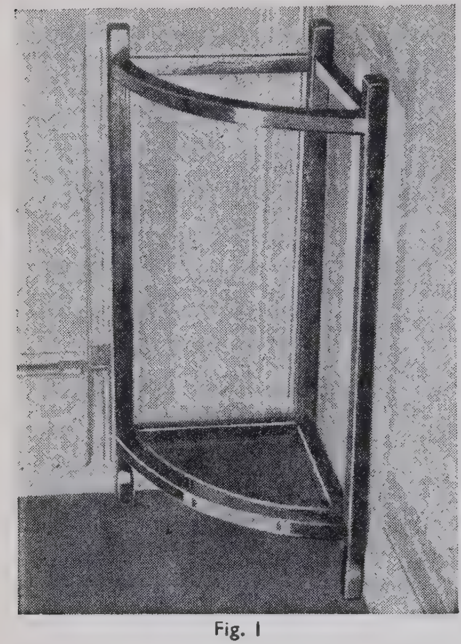


Fig. 1

Making Curved Rails.—To make the front curved rails, two paper patterns will be needed. To make the pattern, procure a sheet of thin paper about 14 in. square and on it draw two lines at right-angles to each other. From the corner where the two lines meet, mark a distance 12 in. and 11 in. respectively on one line and with a pair of compasses set at the 12 in. mark, join the two lines. The arc thus struck represents the outer edge of the rail. Repeat the process with the compass set at the 11 in. mark and join the lines as before. This curve is the outline of the inner edge of the front rail. Cut round the outlines with a pair of scissors and paste the paper on the piece of wood, and repeat the process with the other piece.

When the paste is dry, fix the wood between the jaws of the vice and cut near the outline with a pad saw and finish the rail with a spokeshave, taking care to work in the direction of the grain.

Cut the waste off the ends of the rails so that they are square, and mark and drill the holes for the dowel-pins.

The parts may now be assembled. Use a good liquid glue and fasten the parts together by applying a film to all joints. Bind stout string round the fitment to cramp the parts together, but do not let the cord touch the bare wood or the corners will, in all probability, be marred. To prevent this, pieces of thick cardboard should be placed between the string and wood. When the glue is dry, shape a piece of ¼ in. plywood and fix it with brass screws to the underside of the bottom rail thus forming a shallow tray into which the zinc container fits.

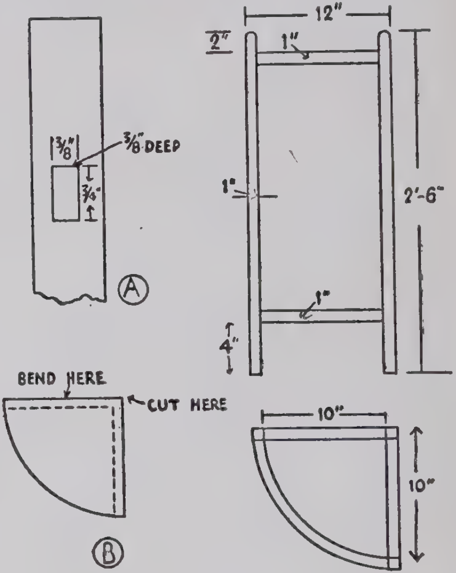


Fig. 2

Cutting and Soldering Zinc.—The zinc drip-tray is made a ½ in. smaller than the recess at the lower rails. To make the tray get a piece of zinc, not too thick, 10½ in. square and mark and cut it to the shape shown at B in Fig. 2, and bend up the two straight sides to form right-angles. This is best done by placing the zinc on the edge of a rectangular block of wood and gently tapping the zinc at the bend. A strip of the same material will be required for forming the curved front of the tray. When this has been cut the soldering materials can be got ready for fastening the joints and fixing the front strip.

In soldering zinc, ordinary spirits of salts is used as a flux; but, as this attacks zinc and eats it away, it is of the utmost importance that the receptacle should be thoroughly washed in water after soldering, to get rid of surplus flux.

Start by soldering the right-angled corner joint and then the front, putting a blob of solder here and there where two edges meet to tack the strip in place, and then running the hot soldering bit along the seam, finally soldering the joints.

As the zinc tray will look unsightly if left in its natural state, it is advisable to give it a couple of coats of paint, either green or brown, to suit the colour of the finished stand.

The completed stand may be stained to the desired depth of colour and varnished, or it may be simply varnished. A pleasing finish can be obtained by applying a few spots of linseed oil to a soft rag and then polishing the surface. If varnish is used, be sure to use a good oil varnish as spirit varnish shows the slightest scratch.

A PORTABLE TOOL CASE

THERE are many jobs outside the workshop and the portable tool case shown in Fig. 1 will be useful for carrying tools on such occasions.

The construction is simple, strong and convenient.

The body is divided into four sections, the largest one for accommodating tools such as planes and the smaller ones for holding little tools, nails and screws. The lid is provided with divisions, the upper one for housing a small hand saw, the lower division to the right for chisels and the space to the left for boring bits.

The arrangement of the body and lid compartments and details of construction can be clearly seen by referring to Fig. 2 at A and B respectively.

The whole of the body is made of best quality yellow deal ½ in. thick except the top of the lid, which is ⅜ in. in thickness. As deal boards are seldom wider than 11 in., the lid and the bottom will have to be built up to obtain the desired width, viz., 16 in. Two pieces of 9 in. prepared stuff should be used for these items and the surplus sawn off and the edges trimmed with a plane.

A glued butt-joint could be used for joining the timbers longways, but better results will be obtained if the edges to be joined are grooved and fitted with a loose tongue, which is afterwards glued up.

In any case, the following prepared wood, including sufficient for waste, will be required for the body.

One board 3 ft. 6 in. long × 8 in. wide and ⅜ in. thick for the top of the lid and a board of the same length and width, but ½ in. thick for the bottom. A 6 ft. 6 in. length ½ in. stuff, 8 in. wide, for the sides and ends.

In addition, a piece 3 ft. long, 6 in. wide × ½ in. in thickness will be required for the partitions in the body, while 3 ft. of 1¼ × ½ in. planed batten will be ample for the divisions in the lid.

A piece of thick leather strap, 9½ in. long × ⅞ in. wide, will make a suitable handle. Eighteen 1 in. No. 6 brass countersunk-headed screws will be necessary for fixing the top of the lid to the lid frame members, and the same

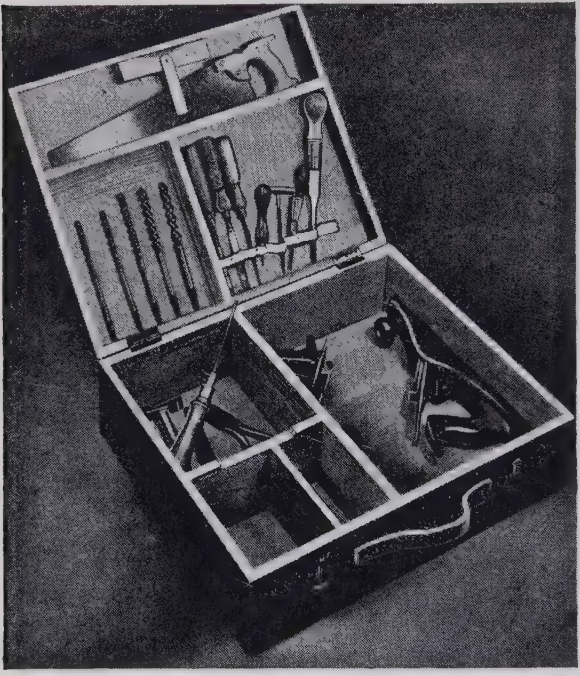


Fig. 1

number of similar screws 1¼ in. long for fixing the bottom. Also sixteen 1½ in. No. 6 screws for fixing the side ends.

For hinging the lid, a pair of 2×½ in. brass butts and a dozen ¾ in. No. 6 brass screws for fixing them should be obtained together with a pair of 2 in. brass hooks and eyes to keep the lid closed.

Simplified Construction.—To simplify construction the joints are screwed butt-joints. The front and back of the body should overlap the ends of the sides and not vice versa, as the front should always present as neat an appearance as possible, unbroken by avoidable joints, as is the case of constructing drawers.

Start by making the top of the lid and the bottom of the box. The timber for these should be sawn ½ in. longer at the ends than the finished size, the surplus being sawn and trimmed up with a plane after gluing.

If the tongued and grooved method of forming the joint is used, plough a ⅛ in. wide groove in the edges to be joined in the lid members as well as those of the bottom. The grooves should be ploughed ⅜ in. deep, and this will require a feather or strip ¾ in. wide for the joint. In forming the joint it is essential that the edges be true and only a faint line should be observed.

Glue the edges and feathers of the pieces to be joined, cramp them up and let them remain in the cramps until the glue is dry.

When ready, the pieces can be removed from the cramps, the surplus wood sawn off the sides and ends and trimmed up squarely with a plane.

Prepare the sides of the body, taking care to see that the ends are square. As the ends of the partitions are housed or recessed into the sides and the ends of the body, the latter should now be grooved to accommodate them. To do this, mark the lines across the wood at

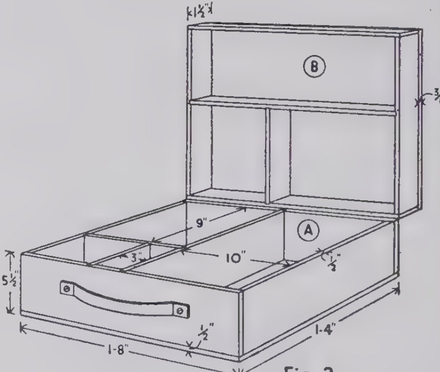


Fig. 2

the correct position and saw at the guide lines, taking care to keep the teeth of the saw within the waste part to ensure a good fit. If the saw cuts into the material on the other side of the lines the resulting joint will be sloppy when it ought to be tight.

The best way to remove the waste material after having sawn to depth is to place the member in the vice and use a sharp chisel first from one edge to the centre and then from the opposite side to the centre and then neatly level the bottom of the channel.

The operation is then repeated with the ends and sides of the lid.

Assuming that the glued joints in the top and bottom boards are quite firm, the parts may be assembled. A number of screw holes should first be drilled in those parts to receive the plain portion underneath the heads of the screws. These holes are necessary as they ensure tight joints.

Screwing and Joining.—As the screwing operation may prove awkward at the outset, it is a good plan to fix the first member to be joined between the jaws of the bench vice and place its fellow member over the supported piece, seeing to it that the edges are flush and then driving in the screws. The same method can be applied in joining the next member and, when this is finished, remove the work from the vice and complete it on the bench.

The frame is now ready to receive the top of the lid or the bottom according to which frame has been assembled first. Both the lid and the bottom are fixed in the same way by simply driving the screws into the edges of the frames. Before driving the screws, make sure that the edges of the board are flush with the sides and ends of the frame.

Now fix the partition pieces into their respective grooves. Use plenty of glue and wipe off the surplus with a rag.

The next job is to fix the hinges. Recesses should be cut in the lower edge of the lid and the upper one of the body. The recesses are cut to a depth equal to the thickness of a leaf of the hinge, so that the surfaces lie flush with those of the wood. See that the hinges are placed squarely before driving in the screws because any other position will strain the joints when opened.

The leather handle is now fastened to the front by means of screws; a small washer being inserted between the leather and the underside of the screwhead. The hooks and eyes are then screwed to the body and lid.

To keep the chisels in position, small loops of thin leather are used, the blades being protected by fitting a length of ¼ in. stripwood to form a groove in the back member of the lid. The hand saw and tenon saw are held by means of similar loops and turn buttons which fit over the handles.

To protect the bare wood and give it finish, the exterior should be glasspapered and then stained and varnished.

NEST OF DWARF TABLES

A NEST of four small tables, as illustrated in Fig. 1, is useful in any home. Those shown in Fig. 2 are made of mahogany and french polished, but any good hardwood may be used. The table-tops, as well as the top rails, are ⅝ in. thick and the legs of 1¼ in. square section material.

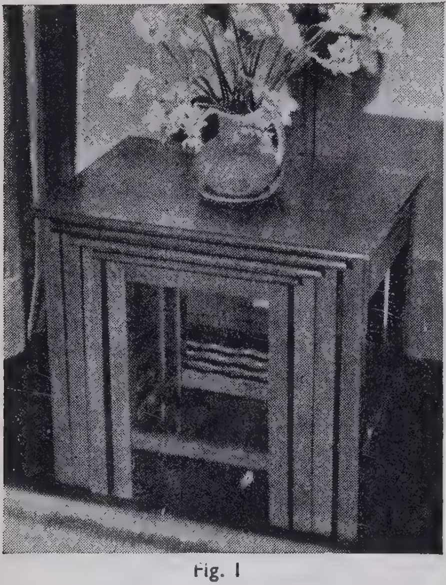


Fig. 1

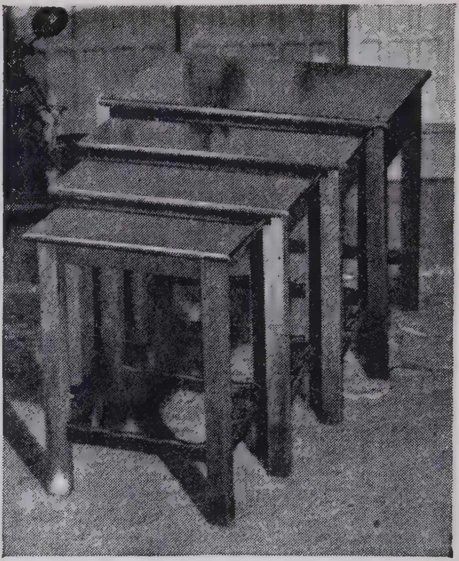


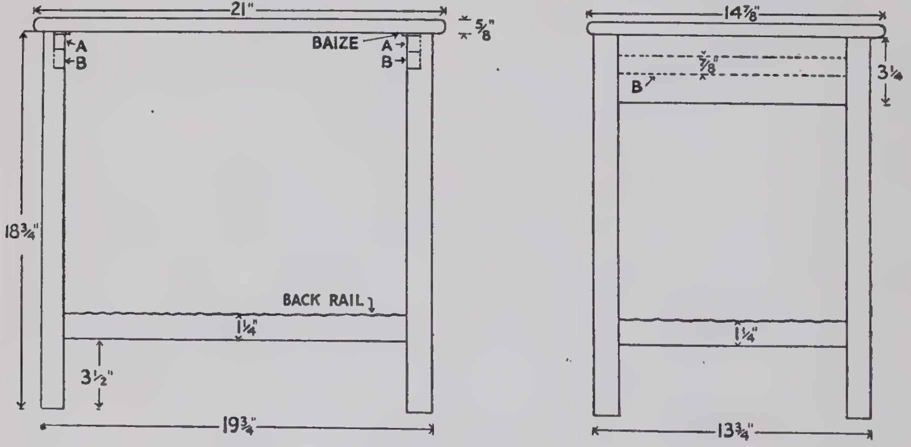
Fig. 2

Glued dowelled joints are used throughout for joining the legs to the rails and the table-tops to the frames.

As the tops of tables 2, 3 and 4 are housed under those of 1, 2 and 3 respectively, no front rails are required; but as no table-top lies beneath the smallest unit, 4, front rails are provided.

The front faces of all top rails are set back $\frac{1}{16}$ in. from the front faces of the legs, thus allowing runners $\frac{9}{16}$ in. thick to lie flush with the inner side faces of the legs, as shown in Fig. 5.

Full dimensions are given in Fig. 4.



FRONT Fig. 3 END

It is only necessary to give construction details of the largest one.

The Largest Table.—The top of this table measures 21 in. long × $14\frac{7}{8}$ in. wide and projects $\frac{5}{8}$ in. beyond the outside faces of the legs. The top, side and back rails are 3¼ in. wide, while the legs are 18¾ in. in length. The bottom rails are 1¼ in. in width.

First prepare the legs. 1⅜ in. square-section stuff will be required and this will have to be gauged and planed to size. This process may be omitted if stock-size, prepared wood be obtained.

When the legs are ready, mark them to length, allowing ½ in. or so at each end for waste, which can be sawn off after having marked and bored holes for the dowel-pins. Two pins of ¼ in. diameter will be required at each joint. These may be home-made by driving a length of hardwood slightly larger than ¼ in. diameter in section through a ¼ in. hole drilled in a piece of steel if a ready-made dowel plate is not to hand. Alternatively, dowel-rods of exact diameter can be bought and cut to length.

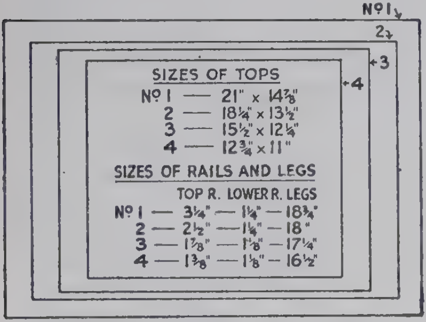


Fig. 4

The length of the pins is 1 in. One will be required at each joint at the legs and rails, and, allowing six for each table-top, this gives a total of eighteen for each large table, an extra eight must be added for the small one, thus giving a grand total of eighty.

The tedium of measuring and marking each pin, preparatory to sawing off from the length can be eliminated by screwing a bench-hook down to the bench and fixing a stop at a distance of 1 in. from the right-hand edge as indicated in Fig. 6. The end of the rod to be cut is butted up to the stop, and the edge of the top member of the bench-hook used as a guide for the saw. Remove the sharp edges from the pins and make a saw kerf in the length of each one.

Next prepare the rails, the ends of which must be quite square to the faces and long edges. Mark the ends for the dowel pins and bore the holes a trifle deeper than ½ in., using a twist-bit ¼ in. in diameter for the purpose. Bore corresponding holes in the legs, remove the waste at each end and saw the top of each leg in the manner indicated at A in Fig. 3 to form a recess into which the table-top of No. 2 unit slides.

Prepare and fix a couple of runners ⅞ in. wide × $\frac{9}{16}$ in. thick and of the same length as the side rails. These can be made of yellow deal as they are hidden from view. They are indicated by the dotted lines B in Fig. 3.

The Top.—The next procedure is to prepare the table-top. This should be made from a single piece of board if possible, but may be built up to width by gluing together two narrower boards. Mark, saw and plane to length and width. Round the edges, chamfer or finish them to whatever shape desired.

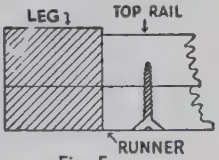


Fig. 5

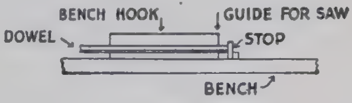


Fig. 6

Smooth the parts with glass-paper not coarser than No. 00, and make preparations for assembly, not forgetting a supply of tube glue which saves the bother of preparing ordinary glue.

Assemble each side frame member using glue. See that the wood at the joints butts closely together and that all is square. When dry, fasten the runners to the inside faces of the side top rails, keeping the upper edges flush with the bottom of the recesses in the legs. Add the back rails, and in order to keep the assembly square, fix a batten across the front and another near the bottom for the time being, to act as front rails.

Having satisfied yourself that the assembly is square, place the table-top in position and mark the places for the dowel-pins on both the underside of the top member and the edges of the rails. Drill the holes and insert the pins. Apply glue to the top edges of the rails and legs and also on the underside of the table-top where it joins the rails.

Place the table-top in position and force it down so that it beds evenly.

To prevent the top of each lower table from being scratched, a strip of baize is glued to the underside of the table above in the positions shown in Fig. 3.

The final process is to finish the tables by any method deemed desirable.

In constructing the tables, note that the width of the top rails is smaller in each instance and that the inner and outer edges of all bottom rails are slightly curved as in Fig. 3, to give them a little more ornate finish than plain edges. A spokeshave will come in handy for this.

If oak is the chosen wood, use brass screws for fixing the runners in lieu of iron ones to prevent corrosion.

RADIO TABLE

A SUBSTANTIAL table to support a radio set is illustrated in Fig. 1. Satin walnut is used and is stained and finished dull to correspond with the receiver.

As satin walnut can be obtained in wide boards, nothing is gained by building up the table-top from narrow ones. Boards 14 in. wide are sold at so much per square foot, and the wood for the top can be purchased for a comparatively small sum.

The dimensioned drawings appearing at Fig. 2 show a drawer provided for housing spare valves, odd bits of insulated wire, screwdrivers, a pair of pliers and other odds and ends.

Measurements.—The top is 20¼ in. long × 13 in. wide and ⅝ in. thick and this is supported by legs 25½ in. in length of 1¼ in. square stuff. The top back and side rails are 4½ in. wide, while the top front and drawer rails are 1¼ in. wide fixed to the legs, with the narrower edge to the front.

The legs can be obtained ready planed to size, but if sawn wood is employed the faces must be accurately planed.

The bottom rails are 1¼ in. wide, ¼ in. thick, and the top edges have a series of wavy curves. Before cutting the legs to length they should be carefully marked for the joints. The ends of the side rails and back rails at the top are tongued and fit into corresponding grooves in the faces of the legs. The tongues extend the entire length of the end—that is, 4½ in.—and are ½ in. deep and ¼ in. wide. The grooves in the legs are, of course, of the same dimensions.

These joints are illustrated at A in Fig. 3.

The front rail immediately under the table-top is dovetailed into the top of the two front legs as indicated at B in

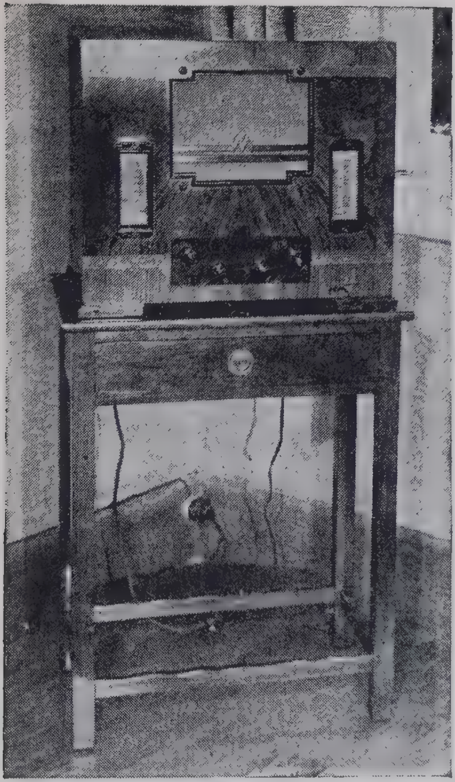


Fig. 1

Fig. 3, while the ends of the drawer rails are stub tenoned and fit into mortices in the legs. The lower rails are all joined to the legs by simple mortice and tenon joints. In assembling the parts it is a good plan first to build up the two pairs of legs forming the ends, using strong glue for the purpose. These parts should then be fixed in suitable cramps after having ascertained that they are square. When dry, add the back rails and the three front ones, and allow the glue to harden before attempting to do more work on it. The whole assembly must be square.

The Drawer.—Details of the drawer are shown at C in Fig. 3. The overall width of the drawer is 1 ft. 4½ in. and 10 in. from front to back. The sides and back are of oak ⅜ in. thick, but the front is of walnut ¾ in. in thickness. Plywood $\frac{3}{16}$ in. thick is used for the bottom and is held in position by means of lengths of ⅜ in. square rebated hardwoods fixed round the bottom of the inner faces of the sides and front. The piece forming the back does not extend right down to the bottom edges of the sides but is stopped ⅜ in. above as indicated at D in Fig. 3. The back edges of the plywood are attached to the lower edges of the back member of the drawer by means of ½ in. brass screws.

A strip of thin wood, hardwood for preference, to act as a drawer guide, is glued to each inner face of the side rails.

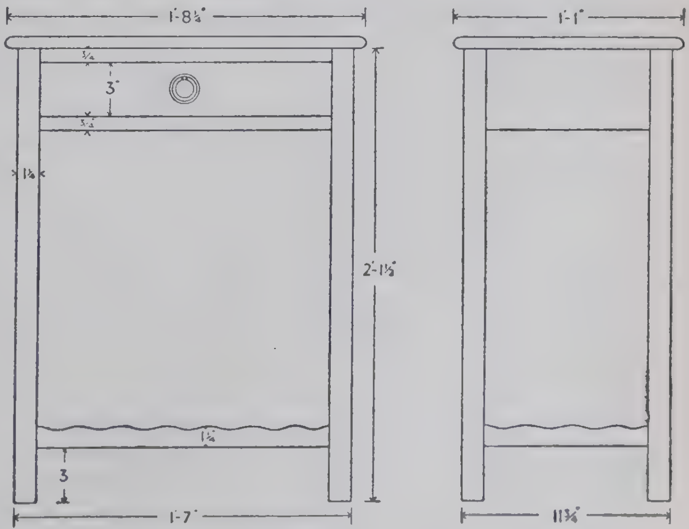


Fig. 2

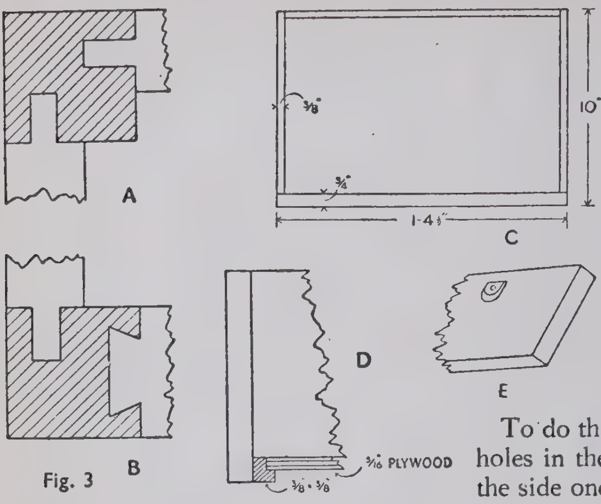


Fig. 3

The strips should be of a thickness to bring the face that butts up to the sides of the drawer flush with the inner side faces of the legs. The drawer runner is 2 in. wide and ¾ in. thick and is fixed by means of screws driven into the guides. The top of the runner must, of course, be dead flush with the top face of the drawer rail.

The underside of the drawer rails is covered in $\frac{3}{16}$ in. plywood to exclude dust.

Construction is completed when the top has been fixed to the top rails. To do this, make three oblique screw-holes in the back rails and two each in the side ones in the manner indicated at E in Fig. 3. Also make three straight holes in the top front rail and fix the top by means of 1½ in. No. 8 countersunk-headed screws.

SELF-CONTAINED BOOKSHELVES AND BOOK REST

SOLID oak is used in the construction of the useful and handsome self-contained book shelves and rest illustrated in Fig. 1.

All wood used is ½ in. in thickness except the ornamental beading along the front edges of the sides and the plywood at the back.

Procure 14 ft. of plain oak 7 in. wide for the sides, base and shelves, one piece 2 ft. long × 13 in. wide for the rest at the top, and 7 ft. of narrow edge beading of any pattern to choice.

See that the timber is in suitable lengths for the job, thus one piece measuring 5 ft. would be sufficient for the three shelves including ½ in. for waste at each end, while another piece 9 ft. in length would be enough for the sides, the curved piece across the base and the two small projecting pieces at the bottom of the side members.

A sheet of $\frac{3}{16}$ in. alder or birch plywood will also be necessary for filling in the back, a few panel pins for fixing it and a supply of 1½ in. No. 6 countersunk headed brass screws.

All dimensions can be seen by referring to Fig. 2.

Start by marking out and cutting the side members, retaining the waste pieces obtained after having sawn across the top to form the angles. From the waste, cut two feet to the shape shown and glue them to the front edge of the sides, and when the glue has set, form the curve at the lower ends of the sides with the aid of a pad saw and spokeshave.

The Shelves.—Attention may now be given to the shelves. These should

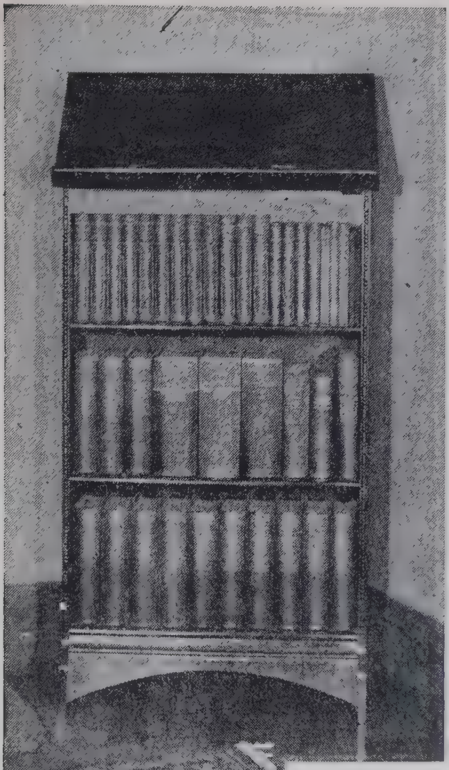


Fig. 1

be sawn to length and the ends shot perfectly square with a plane.

Now saw the 2 ft. length of 13 in. wide wood along its length to produce, when planed, one piece 10¾ in. wide forming the book rest and the other 1¾ in. wide for the ledge. Cut and trim to length and slightly round the top and side edges of the wide piece and also the ends and front of the narrow one.

Mark the side members for the shelves and drill clearing holes for the screws by which the shelves are fixed.

Having bored the holes, countersink the edges to enable the heads of the screws to lie below the surface.

Then fix the ledge to the book rest by driving three screws through the ledge into the bottom edge of the wide board and fix this member to the sides also by screws.

The curved rail at the front of the base, B in Fig. 2, is now cut to length, the curve marked and sawn with a pad saw and smoothed with a spokeshave.

The top edge of this piece slopes back and another narrow strip indicated at A in Fig. 2 lies on the top and fills in the gap between the bottom rail and the lower edge of the shelf. These parts are fixed with glue as is also the beading along the front edges of the side members.

The Back.—Before fixing the plywood back, make sure that the fitment is perfectly square as well as the backing, and having satisfied yourself on this point, mark and cut the sheet and fasten it to the back with panel pins.

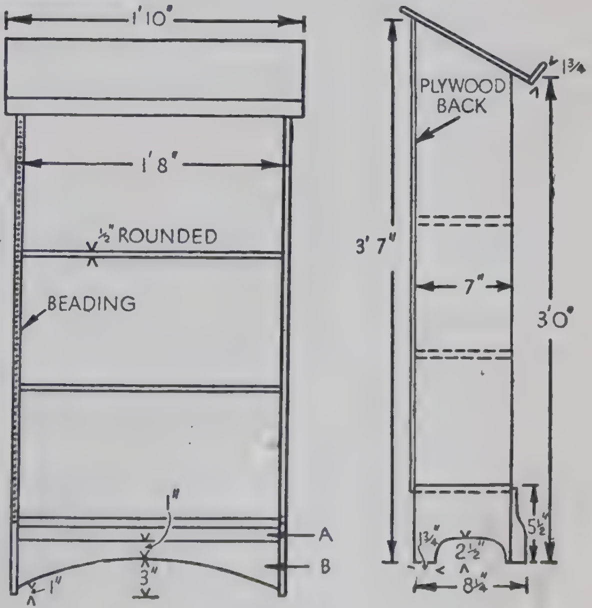


Fig. 2

In order to hide the long edges of the plywood, the piece is cut $\frac{1}{2}$ in. narrower than the overall width of the fitment, giving a bearing surface of only $\frac{1}{4}$ in. on the back edges of the side members.

All screw holes should be filled with plastic wood and the whole glass-papered, stained and finished with two or three coats of french polish applied with a very soft camel-hair brush.

STORAGE CABINET FOR FRUIT

THE storage of fruit is simplified by using a cabinet built on the lines illustrated in Fig. 1. It is constructed of good yellow deal, but a cheap hardwood could be used for the framework.

The cabinet is 2 ft. wide, 3 ft. high and 1 ft. 6 in. from front to back, and consists of two side frames held together by rails and a top of $\frac{1}{2}$ in. plywood.

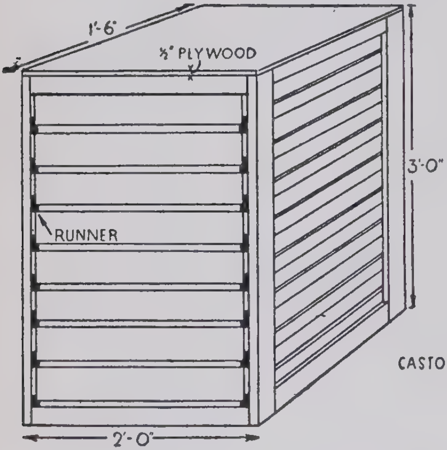


Fig. 1

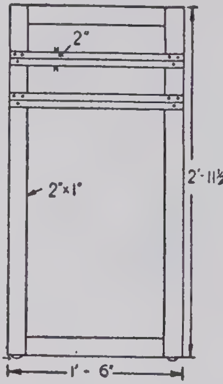


Fig. 2

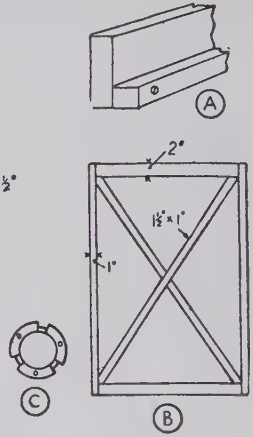


Fig. 3

Eight trays are provided which slide in and out like drawers, and the cabinet is fitted with small castors.

Simple Construction.—Details of the side frames are shown in Fig. 2. They consist of two uprights and a top and bottom rail, 2 × 1 in. planed wood. The tray runners are fixed between the uprights by screws. Each runner consists of a length of 2 × $\frac{1}{2}$ in. batten, having a strip of $\frac{3}{4}$ × $\frac{1}{2}$ in. wood screwed to it to form a ledge as shown at A in Fig. 3.

Glued dowel-joints are used at the corners, and for joining the top and bottom rails at the front and back.

To give extra strength, the back is provided with a cross-brace (B in Fig. 3). The pieces forming the brace are halved at the centre, lying flush.

The sides and ends of the trays consist of planed wood 2 in. wide and $\frac{3}{4}$ in. thick, and ordinary screwed butt-joints are used for fixing the parts together. The bottoms of the trays consists of slats or strips of wood 1 in. × $\frac{1}{2}$ in. thick. These run from the front to the back and are fixed to the underside of the frames by screws spaced 1 in. apart. On no account should a solid bottom be used instead of slats as the latter allows free circulation of air.

Use screws for fixing the plywood top. Small ball-shaped castors as shown at C in Fig. 3 could be used in lieu of ordinary wheel castors.

HOME-MADE FRAMES FOR MIRRORS

THERE are many ways of mounting or framing a mirror. The newest vogue is to mount the glass on a laminated board, showing an inch or two of margin all round, which forms a setting. These margins are coloured to harmonise with the room.

The frame illustrated in Fig. 1 is made by halving the wood together. First square up the wood, oak, walnut or mahogany, to the following sizes.

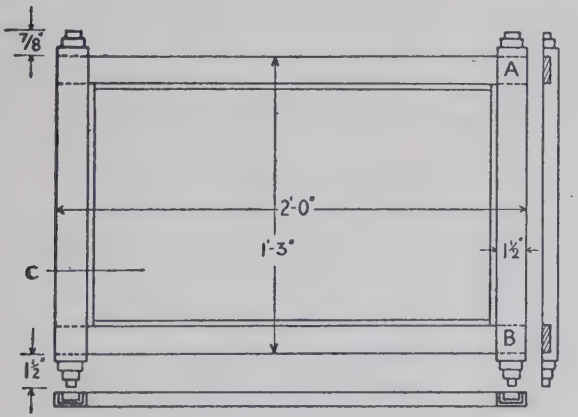


Fig. 1

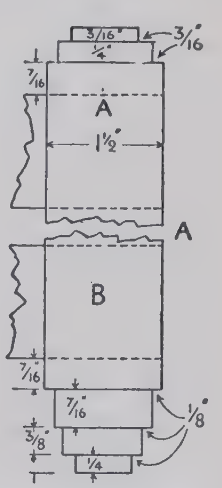
Two pieces for the top and base, each 2 ft. × 1½ in. × ¾ in.; two pieces for the sides, each 1 ft. 5⅝ in. × 1½ in. × ¾ in. Mark these "face side" and "face edge" and remember that the face edges are the inside edges.

Marking Chisel Lines.—On the backs of the two short pieces, square cross chisel lines at 1½ in. from the bottom ends, then 1½ in. again and from the top ends ⅞ in. and 1½ in. Carry these lines down the edges on both sides and gauge between the lines to half the thickness of the wood, i.e., ⅜ in.

Now measure 1½ in. from the ends of the long pieces and square lines across the faces and down the edges. Gauge as before, chisel out the slots from the back of the short pieces and saw away the face halves of the long pieces.

Fit the frame together, take apart and with a small dovetail saw cut out and clean up the little steps as shown in Fig. 2.

Clean up the frame with Nos. 1½ and 1 glass-paper and glue it up, allow twelve hours to dry and then re-glass-paper it smooth.



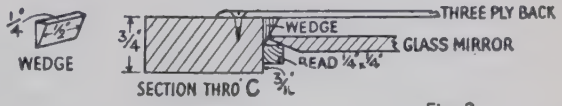


Fig. 2

Make four little ¼ × ¼ in. slips of wood and pin them in $\frac{3}{16}$ in. from the face sides to form the rebate, and prepare twenty-four little wedges size ⅜ in. bare × ¼ × ½ in.

Square up the three-ply back, stain and polish the frame to the required colour, as explained in the chapter on modern methods of wood finishing.

Purchase a mirror $\frac{1}{16}$ in. less in size all round than the rebate measurement.

Turn the frame face down, put in the glass and, gluing on the outsides only of the little wedges, press them in and allow twelve hours to dry. Details of fixing the wedges are shown at C in Fig. 2.

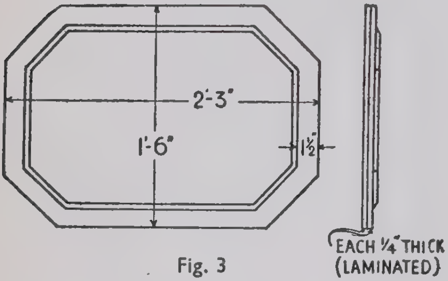


Fig. 3

Then screw on a three-ply back and suitable brass plates for fixing to the wall.

Choosing Wood.—Before starting to make the back panels for the mirrors shown in Figs. 3 and 4, consider the finished colour of the wood. If they are to be silvered or black, the best wood is mahogany. If the wood is to be left unstained, oak, Australian or American walnut will be suitable.

To make the mirror illustrated in Fig. 3, square up two panels, one 2 ft. 3 in. × 1 ft. 6 in. × ¼ in. for the front and one 1 ft. 6 in. × 2 ft. 3 in. × ¼ in. for the back.

The grain of these pieces go different ways and the two pieces are glued together to keep the panel from warping.

To do this, have ready a pot of hot, thin, clean glue and, working in a warm room, place the 1 ft. 6 in. × 2 ft. 3 in. piece of wood on an old table or bench, secure it by putting in some ½ in. veneer pins close to but outside the edges of the panel, knock these pins in so that they stand up $\frac{3}{16}$ in. only from the table top.

Correct Gluing.—Rapidly spread the glue on the panel and on the underside of the top 2 ft. 3 in. × 1 ft. 6 in. panel. Put the top panel on and with a circular motion rub round and round, so as to work out the glue. Wipe the face of the top panel with hot water to keep it from kicking up.

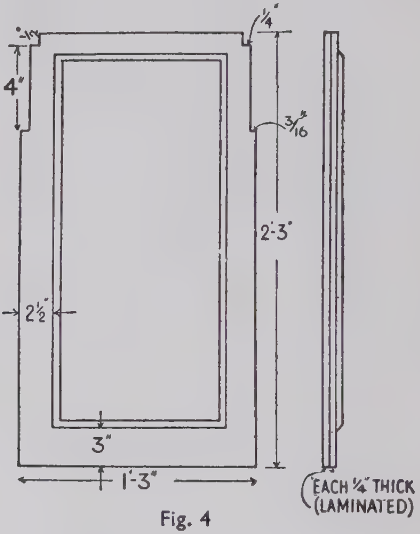


Fig. 4

Then put in some ⅜ in. veneer pins. Knock them where they will not show. Take care pins are not in the way of the lines when sawing off the corners.

Put a heavy box on the panel to keep it flat, or cramp down with a piece of 1 in. stuff placed on top of it, then allow twenty-four hours to dry.

Mark out the corners and carefully saw them off with a dovetail saw. File and glass-paper the edges smooth with fine Nos. 2 and 1½ glass-paper, and clean up the front.

If the margin is to be silvered, purchase some liquid silver paint (not aluminium), put this on in the direction of the grain about 2 in. wide all round. Do not fill up before putting on the silver as the grain itself gives a pleasant effect.

The same applies if you stain with ebony or any other stain. Let the grain show up. If the wood is to be left unstained, polish it with light oak polish, which is put on and rubbed off with a soft cloth.

Allow the panel to stand for a week to become quite dry before fixing the mirror. There are several ways of doing the latter.

You can have eight ⅛ in. holes bored through the glass as shown and screw it on with tiny chromium-plated screws. Or it may be fixed by means of chromium-plated clips.

The mirror panel pictured in Fig. 4 can be made in the same way except that, instead of cutting off the corners, measure 4 in. down from the top and gauge a line 3/16 in. in from the edges and saw this out first. Then measure down from the top ½ in. and ¼ in. from the edges and saw out the top corners. Then clean up and polish as before.

TEA TRAY AND COFFEE TRAY

The trays shown in Figs. 1 and 2 have the edges and corners rounded and the inner corners reinforced and hollowed out so that they may be easily cleaned.

Lay out the cups, saucers and jugs. Turn the saucers upside down and draw a circle round them, repeating with the coffee pot or tea pot and milk jug. The required sizes can thus be ascertained.

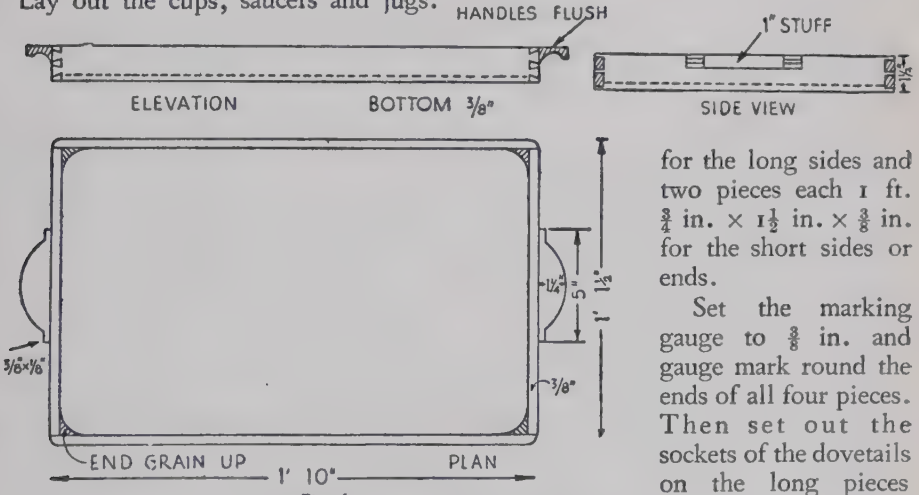


Fig. 1

The colour of the wood should be as near as possible to unavoidable tea and coffee stains. It will be best therefore to make the trays of American walnut or oak stained brown.

The Tea Tray.—To make a tray of the size shown in Fig. 1 square up two pieces of wood each 1 ft. 10 in × 1½ in. × ⅜ in. for the long sides and two pieces each 1 ft. ¾ in. × 1½ in. × ⅜ in. for the short sides or ends.

Set the marking gauge to ⅜ in. and gauge mark round the ends of all four pieces. Then set out the sockets of the dovetails on the long pieces and saw inside the lines with a 6 in. tenon saw.

Place the long ends one by one over the short ends, which should be fixed in the vice. Place the tenon saw in the cuts and pull it towards you with the point of the saw, so as to get a scratched replica of the saw cuts on the short pieces. Square lines down the edges of these and saw down the outside lines.

Chisel out the necessary parts on all four pieces, working half from the back and half from the front.

Fit this framework together, glue the joints, test for squareness and leave for twelve hours to dry.

Meanwhile, cut out and square the bottom of the tray to the exact inside measurement of the frame.

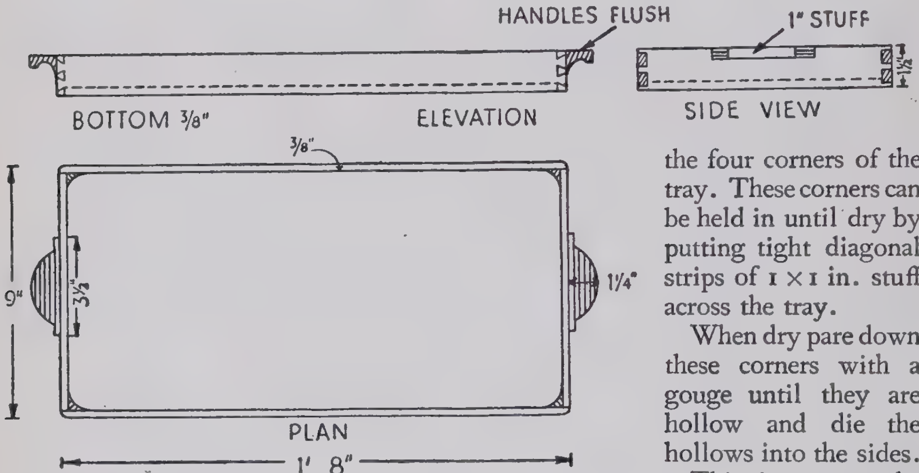


Fig. 2

Fit in the bottom of the tray and secure it by veneer pins tapped in from the outside.

Filling Nail Holes.—Punch the veneer pins below the surface and fill in with brown stopping. This can be made of vandyke brown powder and a small piece of resin about the size of a marble. Drop this mixture in the holes while it is hot, and glass-paper it off smooth.

Now cut out the four reinforcing corners as follows:

Square up a piece of wood size 4 × 1 × 1 in. Draw in pencil, diagonal lines at one end. Place the wood upright on a corner of the tray to get the exact height of the rim, i.e., $1\frac{1}{8}$ in., and square round a line with pencil.

Saw down one of the diagonals, then saw off to the $1\frac{1}{8}$ in. line—thus you have two triangular pieces. Repeat the process until you have four triangular pieces.

With hot glue, press them securely in the four corners of the tray. These corners can be held in until dry by putting tight diagonal strips of 1 × 1 in. stuff across the tray.

When dry pare down these corners with a gouge until they are hollow and die the hollows into the sides.

This is easy as the grain is vertical. Clean the corners carefully with a file and glass-paper, Nos. 2, $1\frac{1}{2}$ and 1, and level off the tops. Cut and square up the two handles 5 × $1\frac{1}{4}$ × 1 in.

The Handles.—Make the two handles out of one piece of wood size 10 × $1\frac{1}{2}$ × 1 in. this way: mark the profiles of the handles on both edges of the wood and saw down the necessary lines across the grain to a depth of 1 in. only. Saw out the two ends and chisel down the centre groove ($1\frac{1}{16}$ × 1 in. deep). Then with a 1 in. chisel round off the handles and smooth them with file and glass-paper.

Turn the shaped piece of wood over in the vice and plane off the back to reduce it to $1\frac{1}{4}$ in., as shown. The extra $\frac{1}{4}$ in. was for fixing in the vice.

Now cut the two handles in halves and clean up the end grain. Next find the centres of the ends of the tray and glue and screw on the handles from inside, taking care to countersink and fill the screwheads with stopping. Hollow out the handles as shown.

Fix the tray in the vice and round off the corners with file and glass-paper. Also round over all the other edges, including the top, bottom and sides, so that the tray is smooth to handle.

If the tray is of American walnut, finish by rubbing with a soft cloth moistened with raw linseed oil and turpentine in equal parts. This will prevent the tea leaving marks upon it.

The Coffee Tray.—To make the tray shown in Fig. 2 proceed in the same way. The only difference is size.

NEEDLEWORK TABLE

The needlework table illustrated in the drawings, Figs. 1, 2 and 3 has several features not usually incorporated in a ready-made fitment which, more often than not, is a simple box on four legs.

As will be seen from the illustrations, the top is not hinged in the customary way at the back, but is divided into two sections which slide along to allow access to a partitioned tray which lies immediately below. The front is hinged to the top of the middle rail and drops down to a horizontal position thus forming a shelf or support at low level which is easy to reach when the user is sitting down. The provision of a drawer adds usefulness to the fitment.

Choosing the Wood.—With regard to the kind of wood to use for its construction much depends on how much the builder is prepared to spend. Where cost is the primary consideration, the framework could be of good yellow deal and the panels and the top made from one of the common kinds of plywood, which could be stained and waxed when completed to give it a finish. On the other hand there are those who believe that it is a pity to spoil the ship for a ha'porth of tar, in which case oak, mahogany or walnut framework and plywood faced with any of these beautiful woods for the panels, would give dignity of appearance. Those parts which do not show could be made of cheaper wood.

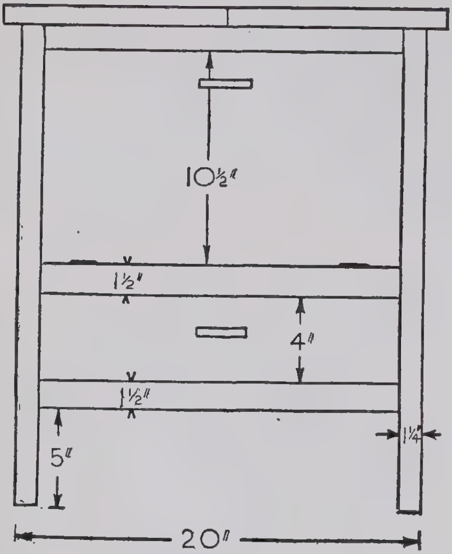
Start with the legs. Mark them to length and then saw them to size. If prepared stuff has been obtained for the framework, there will be no necessity to plane it, but if sawn material is to be used it must be planed to the dimensions given in Figs. 1 and 2.

Next mark out, with the aid of a try square, rule and pencil, on the front pair, the positions where the back and front rails join the legs. These will come on the inner and back faces of the legs. These must be true to length and the ends square, otherwise the joints will be imperfect and the structure out of true when finished.

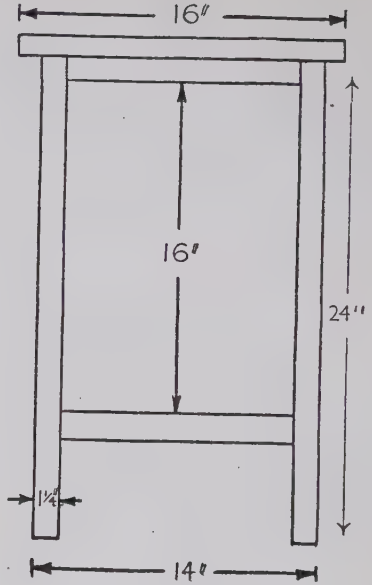
It will be found better to clamp the three front ones and the back pair together for marking purposes. The same applies to the side rails.

Boring for Dowels.—The next procedure consists of marking the positions and boring the holes for the dowel-pins which form the joints. Details of such a joint are shown in Fig. 4. This operation also calls for careful workmanship as the holes in the legs must be bored to line up with those in the rails.

Having completed the boring, which is perhaps the most difficult part of the job, plough the grooves in the legs into which the edges of the panels fit. These will come in the back faces only of the


10½"
1½"
4"
1½"
5"
1¼"
20"

FRONT
Fig. 1


16"
16"
24"
1¼"
14"

END
Fig. 2

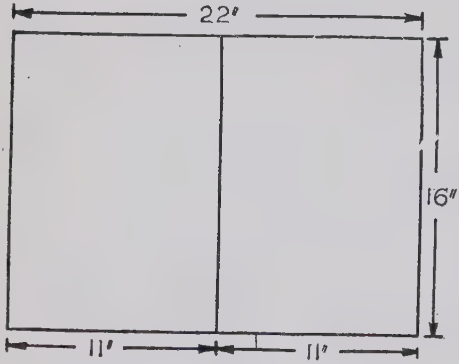


Fig. 3 PLAN

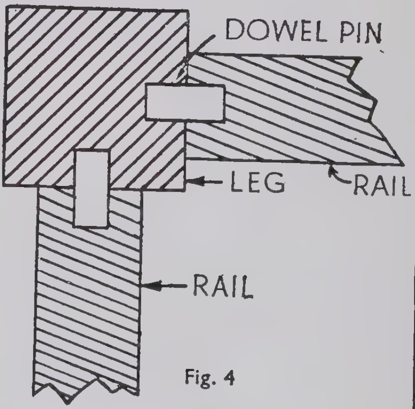

DOWEL PIN
LEG
RAIL
RAIL

Fig. 4

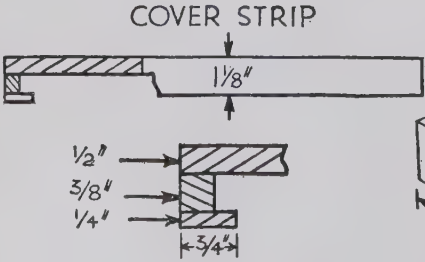

COVER STRIP
1⅛"
½"
3/8"
¼"
¾"

Fig. 5

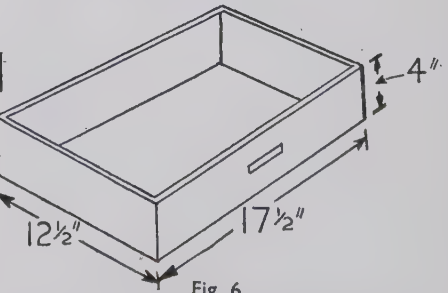


Fig. 6

front pair and in the front and inner faces of the back pair, as viewed from the front.

As the grooves require to be stopped 1¼ in. from the top and 6¼ in. from the bottom, as much waste as possible should be removed by the plough and the remainder taken out with a sharp chisel. The rails are grooved their entire length on either the top or bottom faces, as the case may be. This done, the panels should be marked and squarely cut.

Gluing.—Cramp both frames and test for squareness before finally tightening up. Put these aside in a dry place for about a day to allow the glue to harden.

Then fit and glue the side panels and the rails to the front and back portions and leave to dry.

In the meantime the drawer, tray and sliding tops can be put in hand. These are straightforward jobs and call for little comment.

The back face of the front of the drawer is rebated at the ends to a depth and width of ½ in. to house the ends of the side members. These latter pieces have a groove 3/16 in. wide and 3/16 in. deep, ⅜ in. from the bottom edges, into which the plywood bottom fits. Details of the drawer are seen in Fig. 6.

The tray is made by mitreing the corners of the sides and ends, bradding them together and fixing the bottom so that its edges are flush with the sides. The number and positions of the partitions must be left to the maker's discretion. In any case, either thin slats of wood or plywood may be used and the sides and ends of the tray should be slightly recessed to house them.

Reference to the drawing at Fig. 5 will show the construction of the two sliding tops and the method of forming the groove.

The carcase is yet to be completed. Fix the two pieces of ⅜ in. thick strips by which the top members are kept in position, using countersunk-headed screws for the purpose. Then fix the sides of the drawer runners by gluing and pinning the pieces to the inner faces of the end panels and complete this part of the work by fixing the pieces upon which the drawer runs, keeping the top faces level with the top edges of the side rails.

All that remains to be done as far as the constructional work is concerned is to glue and pin suitable lengths of ⅜ in. square-section wood round the inner faces of the panels to form a fixing for the bottom; pin the bottom to the projections; hinge and fit the stays and the ball fasteners to the front; make and fit the handles, which are wedge-shaped and fixed by screws driven in from the inner face of the front and drawer front respectively; fix the tray by driving screws through the front and back members into the front and back rails; and, finally, slide the tops into position and glue a small piece of wood at a distance of about 3 in. from the closing edges to prevent them from coming out when opening.

The structure should then be sandpapered thoroughly, the interior stained and the exterior finished according to taste. Wax polish is suggested as this is simple to apply and very effective.

HAT AND COAT RACK

THE easily-constructed hat and coat rack, suitable for a small cloak room, shown in Fig. 1, makes an excellent present.

To construct this piece of furniture, details of which are illustrated in Fig. 2, obtain two 2 ft. 6 in., two 2 ft. and two 1 ft. 6 in. lengths of $\frac{3}{4}\times 2$ in. prepared oak (planed). This material is a stock size and may be obtained at most dealers and sells at so much per foot. At the same time, purchase a piece of $\frac{3}{8}$ in. oak-faced plywood 15 in. long and 5 in. wide, two $\frac{3}{8}$ in. $\times$ 2 ft. long dowel-rods, two back plates, 4 ft. $\frac{1}{4}$ in. quarter-round moulding and a mirror 16 $\times$ 8 in., which is one of the stock sizes, half a dozen double clothes-hooks finished in steel bronze or oxidized copper, if the fitment is to be stained dark, or chromium-plated ones if it is to be of a light colour, with round-headed screws for fixing. All parts are fitted together by means of glued dowel-joints which not only form a good substitute for mortices and tenons but have the advantage of being easy to make.

Dowelled Joints.—Cut the pieces to length and mark out the ornamental ends. It is advisable to make a cardboard template of the design and trace round the outline with a pencil. A pad saw will cut out the design.

The next procedure is to bore holes for the dowel-pins. To save time and labour, the top and bottom horizontal members can be marked out at the same time, as the centres of the dowel-holes come in the same relative positions. This operation is best done by clamping the two pieces together and then placing them between the jaws of the vice. The same thing applies to the end and central pieces.

Keep the brace vertical while boring the holes, or the parts will not lie flush and square when they are assembled. The holes should be bored $\frac{3}{4}$ in. deep.

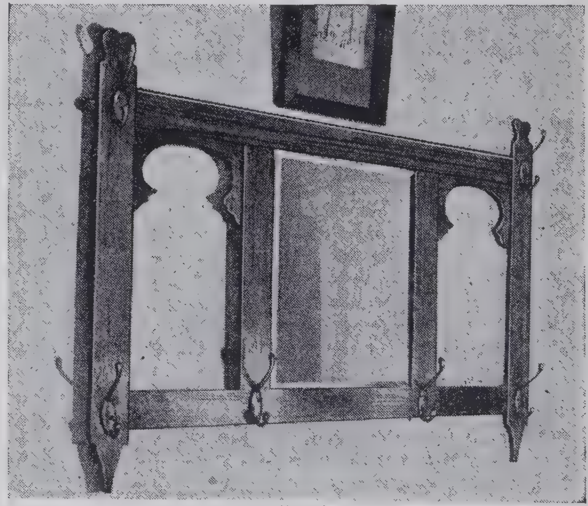


Fig. 1

Having completed the boring, cut sixteen dowel-pins, each $1\frac{1}{2}$ in. long, and make a shallow channel along them as shown in Fig. 3. A tenon saw may be used for this. The channel allows air to escape from the holes during the gluing process.

Then with really hot glue at hand fix the pins and parts together. Do not use too much glue. The frame should now be cramped to ensure satisfactory joints. This can be done by laying the frame flat on the bench top and using pieces of batten and wedges as indicated in the diagram, Fig. 4, unless of course you possess joiner's cramps. The frame should be left in the cramps for about twenty-four hours for the glue to harden.

In the meantime the two ornamental fretted pieces can be put in hand and cut with a fretsaw.

After removing the cramps, the moulding for supporting the mirror can be cut to size and fixed in position with tube glue or panel pins or both.

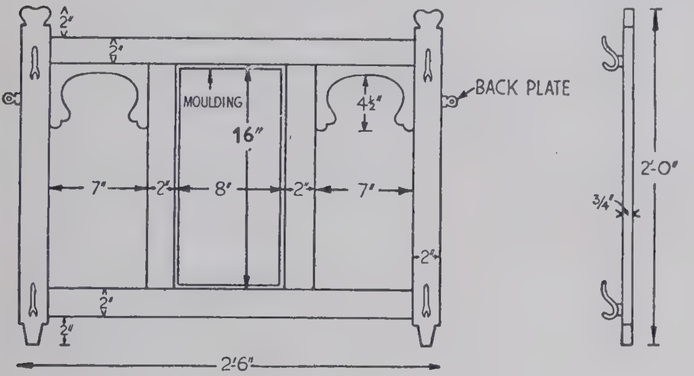


Fig. 2

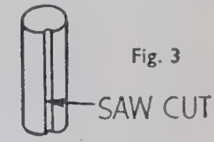


Fig. 3

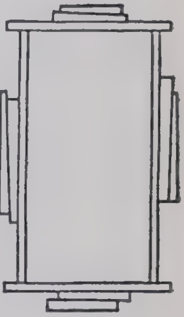


Fig. 4

The ornamental pieces can now be fitted with tube glue and allowed to dry.

Run a finely-set plane over the wide surface and take off one or two shavings unless you have made such accurate joints that the surfaces are all flush.

Fitting Mirror and Pegs.—After having glass-papered the work, apply a light or dark oak stain to suit, and when dry, a good wax polish properly applied will impart an excellent finish.

The final step is to fit the mirror and coat pegs. The mirror is fitted against the moulding, a thin piece of plywood or cardboard fitted at the back and held in position by means of sprigs, and finally covered with stout brown paper, glued to the back of the frame, to exclude dust.

A NEEDLEWORK BOX

An interesting example of light cabinet-making is the needlework box made as follows :—

The box measures $7\frac{3}{4} \times 6\frac{1}{2} \times 5\frac{1}{4}$ in. deep and accommodates a shallow, partitioned tray at the top, a space below for scissors, crochet-hooks and the like, and a drawer for reels of cotton, silk, and thread, with pegs for the reels.

Mahogany is used for the construction and if neatly made and finished carefully with french polish would make an acceptable gift.

As the thickness of the wood does not exceed $\frac{1}{4}$ in. it can be conveniently sawn with a fretsaw.

The top of the lid, the bottom of the compartment and the base of the box are cut from wood $\frac{1}{8}$ in. thick, while the rest of the body is $\frac{3}{16}$ in. thick.

To construct the box, follow the dimensions shown in Fig. 1, and start marking and cutting the exterior parts.

Although the corner joints may be formed by simply butting the members and gluing them together, a much stronger joint is that known as a corner lock joint. This type of joint is made by cutting away small portions at equidistant intervals along the edge of one member to be joined and forming a series of projections in the joining edge of the other. The projections engage in the gaps and when accurately made and glued form an exceptionally strong joint. Such a joint is seen at A in Fig. 2.

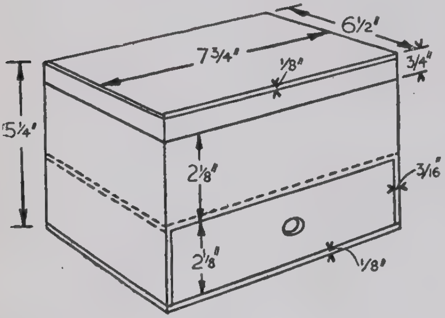


Fig. 1

Assembling the Parts.—When the parts are ready for assembling, fix the ends to the front and back using tube glue. If the members are butted together, use thin panel pins or pins minus their heads to strengthen the joint. The pins are unnecessary with a corner locked joint.

While the glue is still wet, fix on the bottom. Tube glue and ½ in. panel pins may be used for this, unless thin brass countersunk-headed screws are preferred, but, if the latter are used, care must be taken not to split the wood as they are likely to do in a position so near the edge.

Make sure that this part of the work is square and then bind string tightly round to keep the parts cramped together. To prevent damage to the corners, pieces of thick cardboard should be interposed between the string and the wood.

Then assemble the lid, fixing the parts together with tube glue, and bind string round it in the same manner as that of the body. If these parts are assembled in the evening, the glue will be hard by morning.

The bottom of the compartment can now be fitted. To do this, glue and pin supporting fillets of ¼ in. square section stripwood on the inside faces of the body as indicated by the dotted lines in Fig. 1 and glue the bottom member to them.

Fig. 2, B shows details of the tray while the illustration at C in the same figure indicates the method of notching the partition strips where they cross each other at right-angles. The ends of the strip should be housed in shallow grooves cut in the inside faces of the tray. If it is found inconvenient to cut square grooves, they can be V-shaped, in which case the ends of the strips will have to be shaped accordingly to fit. These should be a tight fit and all parts fixed together with glue. The tray rests on a couple of ¼×⅛ in. fillets glued to the front and back faces of the interior.

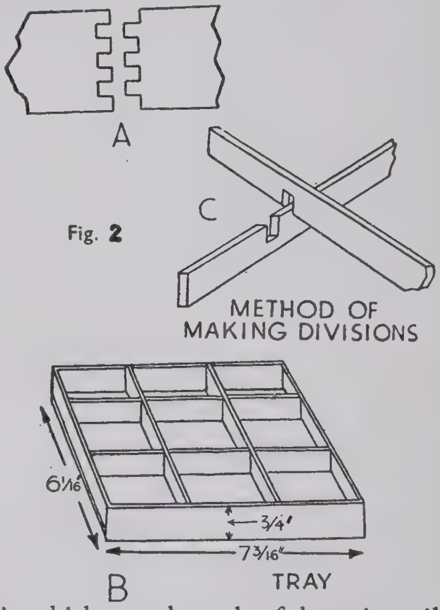


Fig. 2

Making the Drawer.—At A in Fig. 3

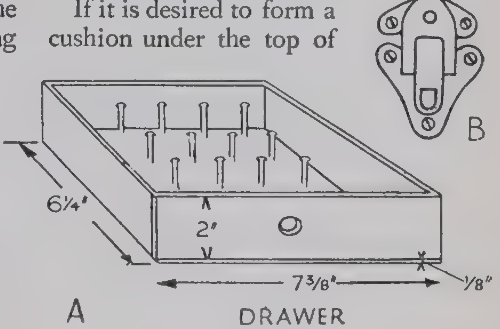
is seen details of the drawer. Make up the frame consisting of the front, back and sides and fasten on to the bottom. A piece of wood ¼ in. thick cut to fit the frame is bored to take three rows of four pegs upon which the reels are placed. The pegs are pieces of $\frac{3}{16}$ in. diameter dowel rod each 1¾ in. long and are glued into the holes in the base. The bottom of the projecting pieces should lie flush with the underside of the base, which, when the assembly is completed, it should be fixed to the bottom of the drawer-frame by two short countersunk-headed screws driven in from the underside of the box.

There is no need to finish the interior with a high gloss. All that is necessary is to give the surfaces a few spots of linseed oil applied with a soft linen rag. This, if rubbed well, will impart a pleasing dull polish, but too much oil must be avoided.

The exterior should be well rubbed down with fine glass-paper and given several coats of french polish applied with a camel hair mop, allowing each layer to harden before applying the next.

To complete the work, the lid should be hinged to the body with small brass butt hinges, a small mahogany knob fixed to the front of the drawer and a suitable fastener as that illustrated at B in Fig. 3 secured by small round-headed brass screws driven into the front of the lid and the box.

If it is desired to form a cushion under the top of the lid for accommodating needles and pins, it can be accomplished by gluing a piece of silk over a foundation of tightly-pressed cotton wool.



DRAWER

Fig. 3

To prevent the bottom of the box from scratching polished surfaces, it is an advantage to glue a piece of neatly-cut baize on the underside.

CHILD'S COT

THE construction of a child's cot of the type shown in the dimensioned drawings, Figs. 1 and 2, is simple. The cot is designed with a view to using a ready-made wire mattress mounted to a wooden framework such as one might secure second-hand.

The usual dimensions of such a mattress are 4 ft. long × 2 ft. wide, but if a wire mattress is unnecessary, the bottom of the cot can be arranged with slats across it to support a mattress of a different kind.

Sides and Ends.—Figs. 1 and 2 show a front elevation and an end view of the cot. The sides and ends are composed of strips of ⅜ in. wood, 1½ in. wide, let into horizontal rails. The ends of these strips or slats are housed in grooves formed in the under faces of the top rails and the top faces of the lower ones the spaces in the grooves not occupied by the slats being filled in with pieces of ⅜ in. square hardwood. This method avoids the process of cutting mortices with a chisel.

Plated metal drop-side fittings may be obtained for about four shillings per set, but the expense of these could be saved by using pieces of electrical conduit for the guides and hardwood buttons for keeping the side or front in position when in use.

The legs as well as the rails should be of a reliable hardwood, but if the cot is to be finished with enamel the slats can be made of good deal.

Dowel-joints are used for fixing the rails to the legs, and a start can be made by preparing the latter. These are 1½ in. square and 3 ft. 2 in. long, but 1⅜ in. wood may be used if desired. If the surface is not already planed when purchased, the rough wood should be planed to size and cut to length, namely 3 ft. 2 in., and then marked and bored for the dowel-pins which form the joints. This is shown in Fig. 3.

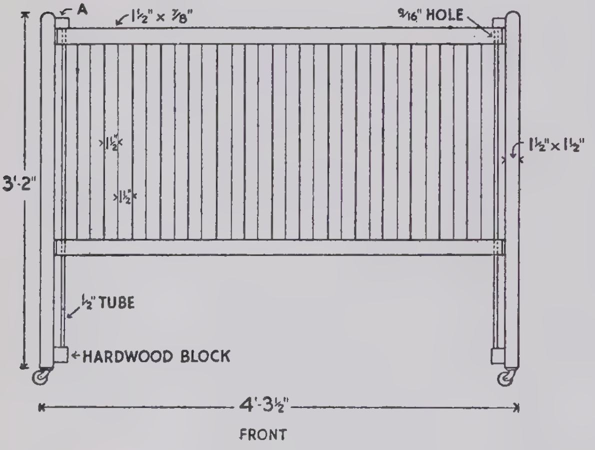


Fig. 1

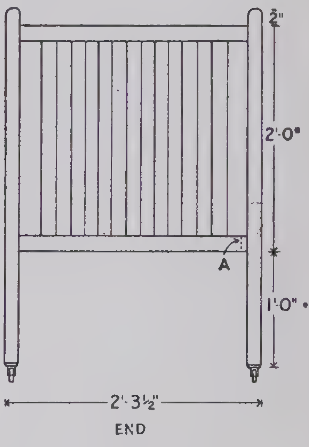


Fig. 2

If difficulty is experienced in obtaining prepared wood 1½ in. wide and ⅜ in. thick for the slats, they can be cut from ½ in. thick (⅜ in. finished) prepared boards 7 in. wide. The strips should be sawn a little wider and longer than the finished sizes, the narrow faces smoothed with a plane and the ends cut square.

The Rails.—Work on the rails can then begin. Mark, saw to length, and locate the positions for the dowel-pins at the ends, and bore them ¾ in. deep. Next form the groove either with a plough or a combination plane. Care must be taken to see that the groove is in the exact centre of the narrow face. Start ploughing the groove from the farther end and work back to the end nearest you, until the full depth of the groove is cut.

Now mark the positions of the slats on the grooved faces of the rails. To save labour, cramp the four long rails together and mark them all at the same time, and then deal with the short ones in the same manner.

As a number of short pieces of equal length of ⅜ in. square wood will be required for filling in the spaces in the grooves, a gauge should be improvised for cutting them to length. The gauge can be in the shape of a bench-hook having a slot in the top piece and a stop on the flat board as indicated at A in Fig. 4. The saw is inserted into the slot, which guides the blade, while the end of the wood to be cut is butted up against the stop.

Having cut the requisite number of

square pieces, glue and pin them into the slots, using liquid glue and 1 in. panel pins for the purpose. Sink the heads of the pins about $\frac{1}{16}$ in. or less below the surface by striking them on the top with a hammer and a fine nail punch made from a wire nail filed to a taper. One face-edge of each rail will now have a number of mortices although they have not been made in the orthodox manner.

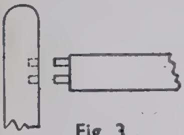


Fig. 3

Skim the grooved faces of each piece with a plane.

Then construct the two end frames by gluing the ends of the slats into the mortices.

Then glue the wooden pins into the legs and complete the joints by brushing glue on to the ends of the rails. Square the frames, fix them in cramps and allow the glue to harden.

Construct the back frame in the same way and prepare the front long rail. There are no grooves in this one. Then join the members to the end frames with glue.

The ends of the front rail are not fixed to the legs but the rail is set back flush with the back faces of the front pair. The ends are dowelled into the two side frames, as shown at A in Fig. 2. This arrangement ties the front legs together without having to rely on the guides and the drop-front.

The drop-front consists of two horizontal rails and vertical slats which are glued into grooves in the same way as the side frames and back.

Front Guides.—A hole is bored with a $\frac{9}{16}$ in. diameter bit near each end of the rails as shown in Fig. 1, to allow the vertical guide rods to pass through. It is essential that these holes be absolutely vertical, otherwise the wood will bind on the guides when they ought to slide easily.

The guides are made of close-joint enamelled steel electric-light conduit, $\frac{1}{2}$ in. in diameter. The rods are threaded through the holes in the rails and kept in position on the legs by fixing small blocks of wood drilled to fit the tube and screwed to the legs as illustrated at A in Fig. 1. The illustration at B in Fig. 4 shows a button for keeping the front in position when in use. Two such buttons will be required and these are fastened to the inner side faces of the front legs by means of screws which should not be driven in too tightly.

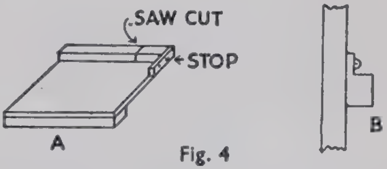


Fig. 4

PORTABLE WASHSTAND

In these days when houses of every description, both in town and country, are being constructed not only with bathrooms, but also with wash-hand basins fitted in many of the other rooms, the usefulness of the portable washstand might seem to have disappeared.

That is not quite the case. The portable washstand is still a useful feature in smaller garages and workshops where the space which it can provide for soap, nail-brush and pumice-stone, render it of value when messy work has to be carried out. In huts on allotments or others for temporary occupation only where the expense of installing a water system is not justified, it can also serve its purpose.

In country districts, there are still many dwellings of the older type which possess no running water system, and here also this type of washstand, which can be moved from room to room, has its uses.

The portable washstand illustrated in Fig. 1 consists of a substantial cabinet of plywood with a hinged lid and a deep enamelled basin, while the interior is sufficiently large to accommodate a waste water receptacle and a water jug, as well as a separate compartment for holding toilet requisites.

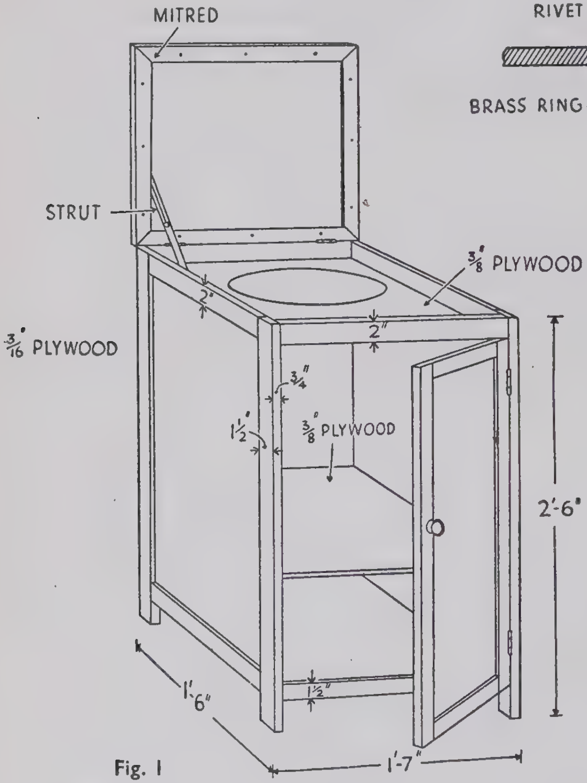


Fig. 1

As indicated in Fig. 1, the overall dimensions of the cabinet are 2 ft. 7 in. high (including the lid), 1 ft. 7 in. wide and 1 ft. 6 in. deep.

The carcase consists of two side frames and a back frame panelled with $\frac{3}{16}$ in. plywood, held together at the front by a top and a bottom rail.

The door is of the panelled frame type to match the sides. The lid is a piece of $\frac{1}{2}$ in. thick plywood fitted with battens round the edges on the underside, the joint and laminations of the plywood being covered with a thin edge moulding. The basin is supported by a piece of $\frac{3}{8}$ in. plywood; the shelf underneath and floor are made of the same material.

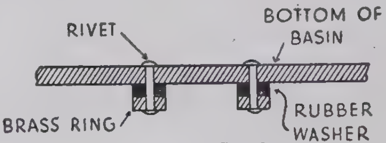


Fig. 2

The Frames.—Make a start by constructing the two side and back frames. The material for the uprights as well as the bottom rails and the frame members of the door, is a cheap hardwood of $1\frac{1}{2} \times \frac{3}{4}$ in. section, though good yellow deal could be used if free from knots and shakes. The top rails are $\frac{1}{2}$ in. wider than the rest, as shown.

All frame members are, except the front top and bottom rails, grooved $\frac{3}{16}$ in. (full) and $\frac{1}{4}$ in. deep to accommodate the edges of the plywood panels. The grooves should be formed after the parts have been marked out and cut to length, and the sheets of plywood must be glued into their respective grooves and kept cramped until the glue has set. Screwed and glued butt joints can be used at the corners or glued dowel-joints if preferred.

The three frames can then be screwed together and the top and bottom rails added.

Before cutting the piece of plywood that supports the basin, measure the actual basin so that a hole of a suitable diameter can be cut to fit it. Use a pad saw for cutting the hole, and smooth the edges with medium grade glass-paper.

The dimensions of the shelf are the same as those of the basin support, and both members rest on 1 × ½ in. strips, glued and pinned to the inner faces of the sides and back. The parts should be sawn and trimmed quite square, and they should be recessed at the corners to clear the frame. The floor is ½ in. longer and wider than the shelf as it is fixed by short screws to the underside, of the bottom rails.

In making the lid, the ends of the battens underneath should be neatly mitred at the corners and they should be fixed to the plywood by screws driven in from the underside into the top.

The edge moulding is 1½ in. wide and ¼ in. thick and the corners are neatly mitred at the joint. Two 2 × ¾ in. butts should be used for hinging the lid, and a suitable metal strut of the jointed type must be fixed to keep the lid open.

The door can be on either side and a small handle and ball catch are needed.

Fitting a Drain Plug.—It is preferable to empty the basin by simply withdrawing a plug and allowing the contents to run into a receptacle underneath, so a suitable hole will have to be made at the bottom of the basin to accommodate the plug. Suitable plugs, ¾ in. in diameter, can be obtained from builders or most hardware shops. The best way to make the hole is to scribe a ¾ in. diameter circle in the middle of the bottom of the basin and then drill a series of small holes as close together as possible round the guide-line. The unwanted piece can then be removed with the aid of a small cold chisel, and the rough edge made smooth with a fine half-round file. A socket for housing the stopper can consist of a piece of $\frac{3}{16}$ in. brass, drilled and filed to form a ring which should be securely riveted to the underside of the basin. A washer cut from a piece of sheet rubber should be inserted between the brass ring and the basin to keep the latter watertight when in use. This is illustrated in Fig. 2.

A proper flanged socket with a screwed lock-nut can be used if desired, in which case all that is necessary is to insert the fitting into the hole, place the washer in position and screw up the lock-nut from underneath.

If the cabinet is intended for use in a bathroom, it can be finished in enamel to match the bath; but if required for a bedroom the fitment can be finished to correspond with the rest of the furniture.

A ROLLER TOWEL RAIL

THE illustrations, Figs. 1, 2 and 3, show how such a rail may be made easily and cheaply.

Plane and square up a piece of sycamore or American whitewood to size 1 ft. 9 in. × 4 × ¾ in. and two pieces for the brackets, each size 3½ × 2¼ × ¾ in.

Find the centre of these pieces and bore two holes ¾ in. in diameter.

Housing Brackets.—On the right-hand one, saw and remove slot into which the roller drops. Saw off the bevels from each of the two brackets and file or plane the edges smooth. Then bore holes for screws in the back piece, countersink and clean the three pieces with fine Nos. 2, 1½ glass-paper. Next tightly screw on the two brackets from the back. Note the screws should go hand-tight through the back piece to ensure that the two brackets will pull up tightly.

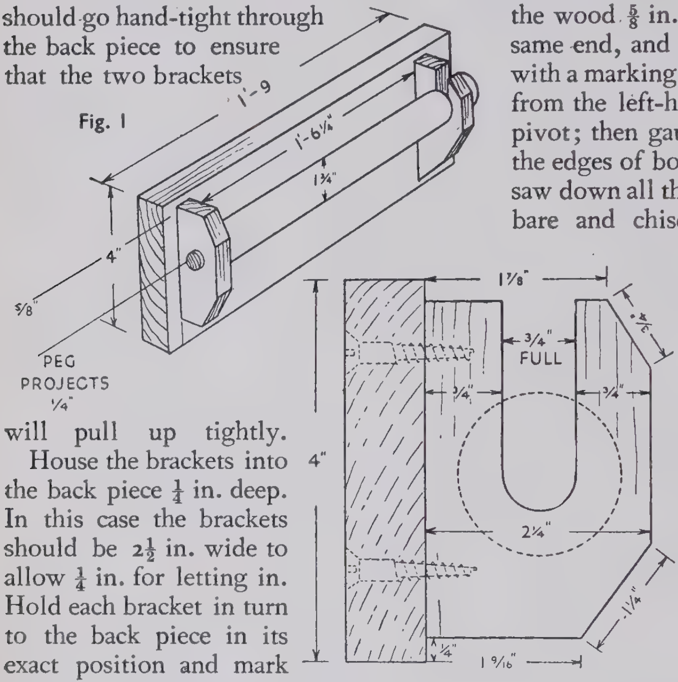


Fig. 1

END VIEW

House the brackets into the back piece ¼ in. deep. In this case the brackets should be 2½ in. wide to allow ¼ in. for letting in. Hold each bracket in turn to the back piece in its exact position and mark round with a sharp pencil. With try square, marking knife or sharp pencil, square across lines on the inside edges of the pencil lines and gauge the lines on the ends of the slots. To chisel these out, clamp the back piece down on the bench, then, holding a 1 in. firmer chisel upright with the face side out, mallet down the long lines, and with a ½ in. chisel, cut down, by hand pressure only, the end of the slots.

Now turn the ½ in. chisel, bevel side down, and cut out the slots ¼ in. deep.

Finally glue and screw the brackets in.

The next thing is the roller. A piece of sycamore or birch will be best as the pivot end and the button will not break off if made in a hard wood.

Square up one piece of wood to size 1 ft. 9 in. × 1¾ × 1¾ in. Now, as the collar on the right and the pivot on the left have to be cut while the wood is in its square form, proceed as follows.

Measure from the right-hand end of the wood ⅝ in., then 1½ in. from the same end, and square lines all round with a marking knife. Now, measure from the left-hand end 1¼ in. for the pivot; then gauge to ½ in. bare from the edges of both ends, and carefully saw down all the squared lines to ½ in. bare and chisel a groove out all round. This can be sawn out both ways on the pivot end. Round the collar and pivot with a chisel, file and glass-paper.

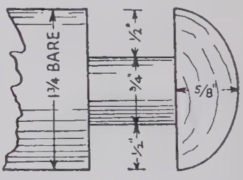


Fig. 2

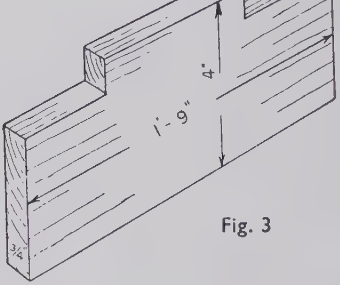


Fig. 3

Forming the Roller.—Then set out an octagon in the right end, carry the lines down the length of the wood and carefully plane off. Plane off the ridges and the roller now has sixteen faces. Plane these ridges off and keep on taking them off until the roller is round. Remember to take off finer shavings as the work proceeds. Now round off the button as shown in the detail, Fig. 2, then carefully smooth the roller with Nos. 2, 1½ and 1 glass-paper.

The ¾ in. hole in the left-hand bracket must now be enlarged with a coarse half round file so that there is play for the roller to be put in at that end and dropped into the other.

It may also be necessary to ease off the wood down the sides of the slot.

The sketch appearing at Fig. 3 shows an alternative shape for the back.

The corners of the brackets should be sawn out square ¼×½ in. so that they are in sympathy with the back. The button in this case should not be rounded over.

To give a final finish to the work, go over it with some white wax or light oak polish and polish with a soft duster. Do not polish the roller.

MAKING AND FITTING CLOTHES POSTS

THE clothes post illustrated in Fig. 1 is removable and is also provided with a loose box for accommodating the clothes line.

Obtain a 9 ft. length of good yellow deal, remove the roughness with a plane and bore two ¾ in. holes with the aid of a twist-bit, 4 in. from the top, through adjacent sides as shown, and cut two pieces of dowel rod, 8 in. long, round the ends to remove the sharp edge and drive them into the holes.

A Pulley Hoist.—If a pulley is preferred to pegs, there are several ways of fitting one. An easy method is to procure a galvanized pulley sheaf as used for wireless aerials, and attach it by galvanized wire to a strong screw-eye in the post, as illustrated at A in Fig. 2. Another way is to get a bracket pulley and fix it to the post with wood screws. This is indicated at B.

The method represented at C is perhaps the best, but the top end of the post requires to be morticed right through to house the pulley. The mortice should be as wide as the thickness of the pulley plus ¼ in. to enable a washer ⅛ in. thick to be inserted between the wood and the pulley at each side of the latter. A 3½×¼ in. bolt serves as a spindle. It is fixed by a suitable nut.

The top of the post should be provided with a cap shaped from a piece of wood 1 in. thick, and to give the cap a finished appearance, the top edges should be chamfered. The cap also keeps moisture from entering the end grain of the wood. A piece of sheet zinc will do equally well. Use galvanized iron nails for fixing the metal, as uncoated nails will rust.

At a distance of 1 ft. from the bottom end, pieces of planed batten 1 in. thick × 1½ in. will be needed for a collar, the top edges of which should be bevelled as shown and fixed by galvanized nails.

An iron cleat, obtainable from an ironmonger's, will be required for anchoring the line. This should be fixed by screws at about 3 ft. 6 in. above the ground level.

The box measures 7 in. wide, 7 in. back to front, and is provided with a sloping hinged lid. The thickness of

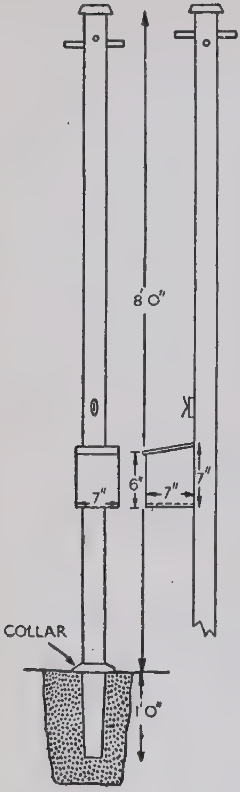


Fig. 1

the wood should not be less than ½ in., and it should be planed.

Brass butt hinges should be used for fixing the lid, and a couple of holes drilled in line near the top at the back, to accommodate the ends of two nails driven slantwise into the post.

The socket into which the post fits may be either of wood or cement. The latter is better, as wood—especially soft wood—rots very quickly below the ground. A wooden socket should be made of timber at least 1 in. thick and the two opposite sides should extend 6 in. beyond the others as indicated at D in Fig. 2.

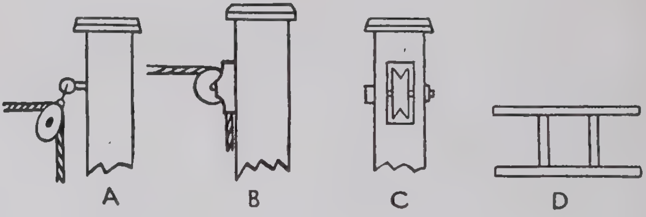


Fig. 2

The Post Socket.—Give the wooden socket two or three coats of creosote before burying in the ground. Fill the hole with broken brick, stones, and ram it well down, taking care to keep the top of the socket a little above the ground. Make a suitable wooden cap or stopper to keep out the soil when not in use.

To make a cement socket, excavate the soil to a depth of 12 in. and about 12 in. square, and, in the centre of this, suspend a length of 3×3 in. wood to act as a core and then fill the hole with cement mortar. The wood core should be carefully planed, slightly tapered from top to bottom and coated with grease to enable it to be withdrawn when the cement has set. A strong cement mortar can be made by mixing one bucketful of portland cement with three bucketsful of clean sand, thoroughly incorporating them together in the dry state and then mixing with water. Any cement mortar left over can be used for making a cover by constructing a mould and then filling with cement. If this method of socket construction is adopted it will be necessary to taper the lower end of the post.

In order to preserve the post, give it either two or three coats of lead paint or creosote.

When a woven rope is employed for a clothes line it should always be removed after use and not allowed to remain out in wet weather.

BEDSIDE CABINET

The bedside cabinet shown in Fig. 1 is for a bed less than 2 ft. from the ground. The height can, of course, be altered to suit any bed.

The illustration shows a bed cabinet, the flap of which goes over, when opened, the left-hand side of the bed. The hinges may be reversed to serve the right-hand side.

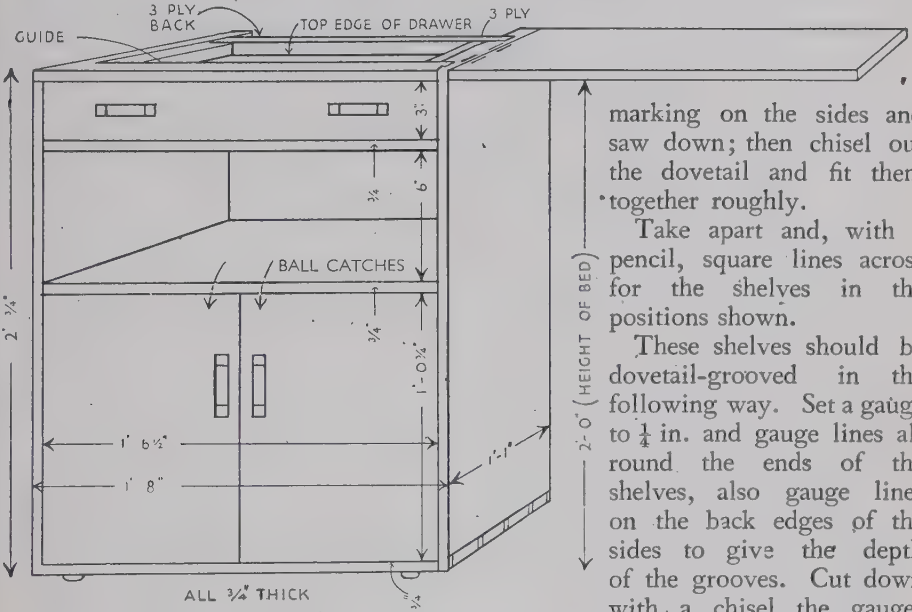


Fig. 1

Suitable woods to use are mahogany, Austrian wainscot oak or walnut. Procure dry, first-quality wood.

Square and plane the following pieces of wood:

Two pieces for the sides, each 2 ft. $\frac{3}{4}$ in.×1 ft. 1 in.×$\frac{3}{4}$ in.; one piece for the bottom, 1 ft. 8 in.×1 ft. 1 in. ×$\frac{3}{4}$ in.; two shelves, each 1 ft. 7 in.× 1 ft. $\frac{1}{2}$ in.×$\frac{3}{4}$ in.; two top rails, each 1 ft. 7$\frac{1}{2}$ in.×1$\frac{1}{2}$×$\frac{3}{4}$ in.

Dovetail Joints.—Dovetail the bottom and sides together, as shown (see detail A in Fig. 2), by gauging lines $\frac{3}{4}$ in. from the four ends. Then set out the sockets and saw down carefully. Place the ends in the vice and put the bottom piece on the ends of the sides and mark through the cuts of the sockets with a small tenon saw. Complete the marking on the sides and saw down; then chisel out the dovetail and fit them together roughly.

Take apart and, with a pencil, square lines across for the shelves in the positions shown.

These shelves should be dovetail-grooved in the following way. Set a gauge to $\frac{1}{4}$ in. and gauge lines all round the ends of the shelves, also gauge lines on the back edges of the sides to give the depth of the grooves. Cut down with a chisel the gauge-lines on the shelves to $\frac{1}{16}$ in. deep and slope down from the edge to $\frac{1}{16}$ in. deep so as to form the dovetails. See detail C in Fig. 2.

As these dovetails and grooves are set back $\frac{1}{2}$ in. from the front edges of the cabinet, saw out from the front edges of the shelves $\frac{1}{2}$×$\frac{1}{4}$ in.

Now chisel out the grooves $\frac{1}{4}$ in. deep, but stopping them $\frac{1}{2}$ in. from the front edge. Fit these shelves in and then take them apart again.

Notch out the ends of face-edges of the top front rail $\frac{1}{2}$×$\frac{1}{2}$ in. and drop this into the sides. Drop the back rail in but do not notch it.

Note the back rail comes against the plywood back. Take the work apart again, and on the inner faces of the two sides plough grooves ¼×¼ in. and ¼ in. from the back edges. Put together and fit in a plywood back ¼ in. thick.

Now square up the drawer front to 1 ft. 6½ in.×3×¾ in. and fit it in.

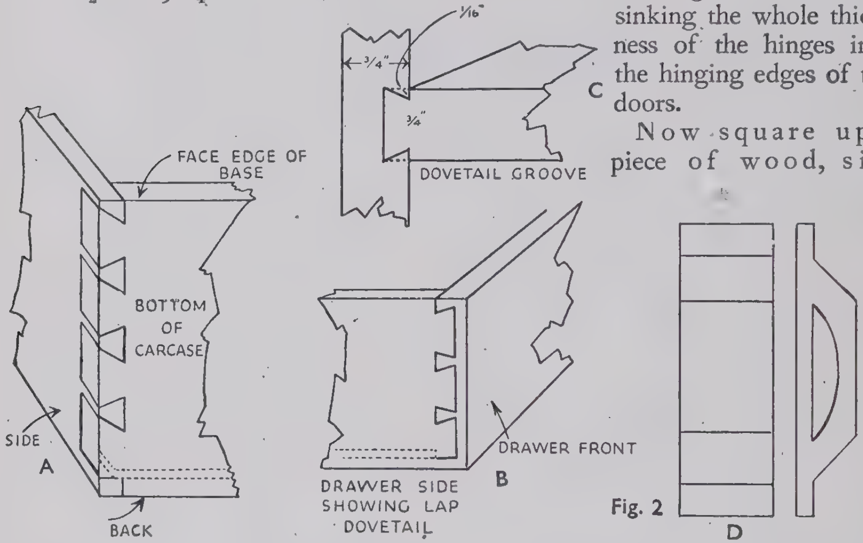


Fig. 2

Square up the sides and back of the drawer to the required size, ½ in. thick only.

Lap-dovetail the drawer together as shown at detail B, groove the sides and front and slide in from the back a plywood bottom ¼ in. thick.

Glue up the drawer, test for squareness and allow twelve hours to dry.

Clean up the whole carcase and finish with Nos. 1½ and 1 glass-paper.

Assembling Details.—Put it together in the following sequence, using hot, thin, clean glue. (1) Glue in the bottom; (2) the top rails; (3) the top shelf; (4) the bottom shelf.

The shelves will have to be pushed or knocked in from the back edges of the sides. Next, slide down the plywood back and cramp the carcase. Allow twelve hours to dry, then plane off the sides of the drawer and fit it in.

Next square up two panels each 1 ft. ¾ in.×9¼×¾ in. for the doors and fit them in, making the heart sides the face sides (front).

The next operation is to fix a pair of 1½ in. brass butt-hinges on the doors sinking the whole thickness of the hinges into the hinging edges of the doors.

Now square up a piece of wood, size 1 ft. 2 in.×1 ft.×¾ in., for the handles. On the edges of the wood set out the profiles as shown in detail D in Fig. 2. Square lines across and saw with a 6 in. tenon saw down the lines to ½ in. bare. Shape the four handles and finish off while they are in one piece. Then divide them.

Screw the handles on drawers and doors from inside and countersink the screw-heads' surface so that they can be filled with stopping of the required colour.

Put two ⅜ in. ball catches on each door as shown in Fig. 1. To do this drill ⅜ in. diameter holes ¾ in. deep at about 1 in. from the edges of the doors, then knock in the ball catches level with the surface. Fix on the underneath of the carcase four domes of silence (1½ in.

in diameter) or castors. Domes of silence are better as they do not get out of order.

Screw a strip of wood between the top and bottom of the cupboard 1½×¾ in. Set this back ¾ in. from the front edges so that it forms a stop for the doors.

Countersink and fill up the top holes.

The arrangement of shelves inside the cabinet is left to the discretion of the constructor. Probably it will be best simply to fix them on battens about ⅝ × ⅜ in. and to screw the battens on.

The shelves can then be easily altered if required.

Hinges.—The hinged lid or flap should now be squared up to 1 ft. 8 in. × 1 ft. 1 in. × ¾ in. Make the heart-side the face (top) side. It will be best to have one long piano hinge stretching from rail to rail as strain may be put on the lid when open.

The hinges should come well over (¾ in.) to the inner edges of the sides and should be screwed down with long screws into the end grain.

The wood in this case should be equally taken out of the sides and lid, so that the hinges are flush when the cabinet is open.

Note the lid might be increased in length if necessary. It would then overhang on one side when closed.

Before hinging the lid, staining and polishing should be done.

If the wood is American walnut, wax polish it. If mahogany, stain with a hot solution of bichromate of potash, rub down with canvas and wax polish. If oak, use a light oak polish.

Methods of darkening are given in Modern Methods of Wood Finishing.

CHILD'S PLAY PEN

THE play pen, constructional details of which appear in Fig. 1, may be easily moved from place to place.

It is sufficiently strong and balanced for a child to pull itself by the rails. Every part is rounded over and a wood should be chosen that does not splinter.

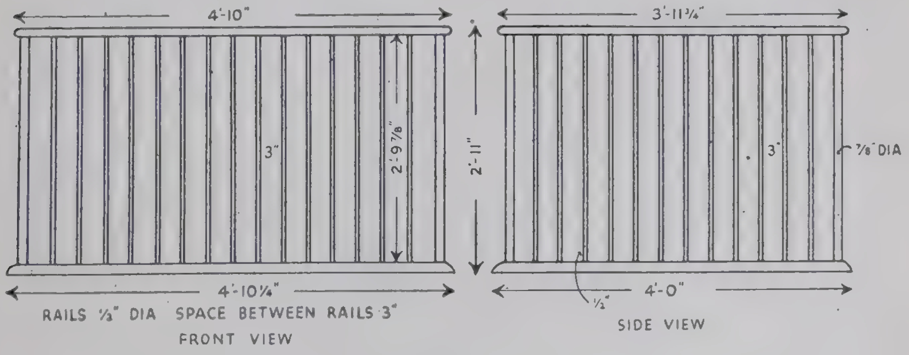


Fig. 1

The frame would be best made out of American whitewood (not deal) and the railings out of birch or beech, so that they will withstand strain on them.

Plane and square up the following pieces of whitewood: two pieces for the long top rails, each 4 ft. 10 in. by

$1\frac{5}{8} \times \frac{1}{2}$ in.; two pieces for the top end rails, each 3 ft. $11\frac{3}{4}$ in. $\times 1\frac{5}{8} \times \frac{1}{2}$ in.; two pieces for the long members of the base frame, each 4 ft. $10\frac{1}{4}$ in. $\times 1\frac{7}{8} \times \frac{5}{8}$ in.; two pieces for the ends of the base frame, each 4 ft. $\times 1\frac{7}{8}$ in. $\times \frac{5}{8}$ in.

These two pieces of framework are fixed together with open mortice and tenon joints, as shown in Fig. 2.

The Bar Holders.—Mark the face-sides and face-edges on all pieces. The face-sides are the top wide faces of the frame and face-edges are the inside edges.

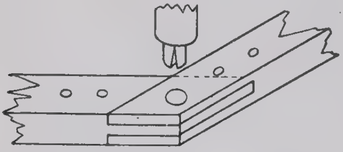

SHOWING CONSTRUCTION OF BASE & TOP

Fig. 2

Make the base frame first, as follows. Measure $1\frac{7}{8}$ in. from the ends of the two long pieces and, with chisel or marking knife, square deep lines all round.

Measure the same distance from the ends of the short pieces and square pencil lines all round.

Set the gauge to one-third and then two-thirds of the thickness of the wood and gauge round all the edges from the $1\frac{7}{8}$ in. lines and across the end edges as well.

Saw down the tenons and open mortices, taking care that the saw-cuts are taken out of the waste side of the lines.

When sawing the long and the short pieces, look on the right and left of the saw, keeping the gauge-lines in.

Having cut out the mortices and tenons, fit them together to verify that all is correct. Next, take the frame apart and gauge centre-lines on both sides of all the pieces, then set out 3 in. spaces and $\frac{1}{2}$ in. rails all along each piece. Square across pencil-lines and take them all round as these rails go through the base.

Now make the top frame in the same way, except that you gauge $1\frac{5}{8}$ in. from the ends and only gauge the centre-lines on the under side of it, as the rails only go in $\frac{3}{8}$ in.

Make and fix this top frame in the same way as the base. Put the base frame together again, stand the top frame vertically on its edge and mark off the corresponding $3 \times \frac{1}{2}$ in. lines across it.

Now mark the corner upright rails by squaring four 3 ft. $\times$ 1 in. $\times$ 1 in. lengths of wood and square all round the shoulder-lines, which are 2 ft. $9\frac{7}{8}$ in. apart. Saw out the little tenons at the ends $\frac{1}{2}$ in. in diameter. These may be rounded, as shown, or left square.

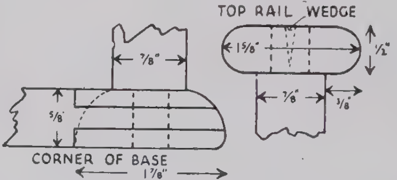


Fig. 3

Then plane the lengths to octagonal shape and continue to take off the ridges until they are round. Finish with middle 2, fine 2, and 1 glass-paper.

Making the Bars.—Now make all the $\frac{1}{2}$ in. diameter rails in the same way and cut off exactly to the required lengths, and see that they really are $\frac{1}{2}$ in. in diameter.

When making these, take an odd piece of wood and bore a $\frac{1}{2}$ in. diameter hole in it, so that each rail can be tried to ensure a tight fit.

Ready-made hardwood dowel-rods could be used if desired.

Bore all the holes with the same bit, right through the base frame and $\frac{3}{8}$ in. into the underside of the top frame.

Then glue up each frame, cramp, and leave for twelve hours to dry.

If there are no cramps to hand, place

the frame on the floor and knock in some 2½ in. wire nails outside the frame. Little wedges of wood can then be driven in between the nails and frame to push the shoulders up tight.

Test for squareness and put in 1½ in. panel pins in the exact centres of the corner rail-holes. When dry, bore (or mortice square) these ⅞ in. holes and fit in the four upright rails.

Remove these rails and round over the edges of the frames as shown with a small iron smoothing plane, but be careful not to strain the frame and break the joints. Parts of the inside edges will have to be chiselled up into the corners unless a bullnose plane is used.

Glass-paper every part smooth, taking care there are no splinters.

Take the corner rails and saw little wedge-shaped pieces out, like the wedge in a hammer (see Figs. 2 and 3.)

Make some hardwood wedges in readiness and glue up. Use hot glue and work in a hot room, otherwise the glue will chill before all the rails are put in place.

Working quickly, and starting at the right-hand corner of the base-frame, dip each rail rapidly into the glue pot, which should be kept hot on the stove, and put them in the holes.

It is best to have someone following up and tapping them home with a hammer and keeping them as upright as possible.

Leave these for a moment and with a small stiff brush (round sash tool) put glue in all the holes. Here again a helper is required. Put this frame on the table and turning the base-frame upside down, tap the rails into the holes. Use a piece of flat wood, about 6×2×1 in., held under the hammer, to avoid denting the wood.

Put the pen on the floor and tap in the little corner wedges. Wash off all glue with hot water and allow to dry.

Finally glass-paper again to a smooth finish and leave the wood natural colour.

BATHROOM FITTINGS

As a bathroom is subject to moisture, it is important to make woodwork as waterproof as possible. To do this, there is no better way than a couple of coats of priming paint and a finish of good enamel, the colours of which should harmonize with the decorative scheme. To avoid the effects of dirt and dust, the larger fittings, such as the soiled linen hold-all and stool, should have more or less plain surfaces, that is to say, exterior panelling should be avoided

The Linen Hold-all.—As will be seen in Fig. 1, this is a corner fitment with a curved front. Where a corner is not available, a rectangular hold-all could be made on similar lines.

For the hold-all shown, a supply of 1×1 in. yellow deal will be required for the upright parts of the framework, a length of batten 1½ in. wide and 1 in. thick for the horizontal rails, and two pieces of board 2 ft. in length×5½ in. wide and ¾ in. thick for the curved members, sufficient 3/16 in. alder plywood for covering the front, sides and bottom, and a piece of ⅜ in. plywood for the lid.

Fig. 2 shows a plan of the framework, while Fig. 3 illustrates one side of a frame. The side rails represented at A and B are joined to the uprights D, E, F by means of dowels, while the ends of the curved piece C are let into recesses ½ in. wide cut sufficiently deep in E and

F to allow the top of C to be flush with the tops of the uprights and the rails. Short blocks of wood are screwed to the side faces of E and F immediately below the ends of the curved member C to reinforce the joint. Screws are then driven into holes bored near the ends of C into the uprights and the blocks. The same method of construction applies to the bottom of the framework.

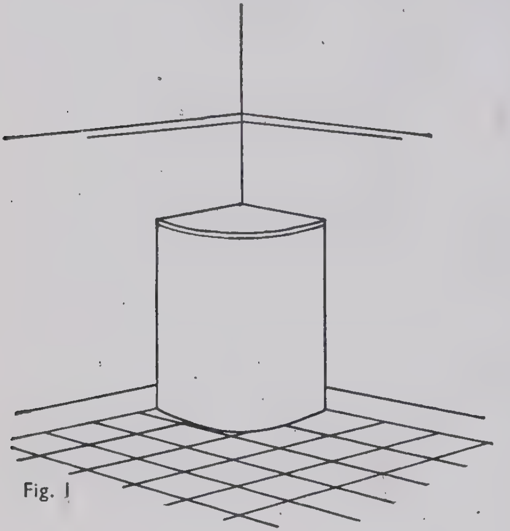


Fig. 1

As the making of the curved pieces may appear difficult, a few words on the subject will not be out of place. The best way to construct these parts is first to make a paper template or pattern for each piece, paste it on the board, cut round the outline with a pad saw and trim the edges with a spokeshave. In making the templates, all that is necessary is to procure a piece of paper about 15 in. square, draw two lines 14 in. long at right-angles to each other and strike an arc of 14 in. radius joining the two points. In the absence of a large compass, use a thin strip of wood with a small notch at one end to accommodate a pencil point and an ordinary pin driven through exactly 14 in. from this point. Then, with the pin point stuck in the corner formed by the right-angle, draw the arc by holding the pencil vertically in the notch and moving it from one point to the other. Fig. 4 shows the operation.

Having assembled the frame, the plywood is cut to size. The front of the piece forming the bottom must, of course, be shaped to suit, and then pinned down to the upper edges of the lower portion of the frame, thus leaving a gap of 1½ in. between the underside and the floor. Next fit the curved front. This piece can easily be bent to the

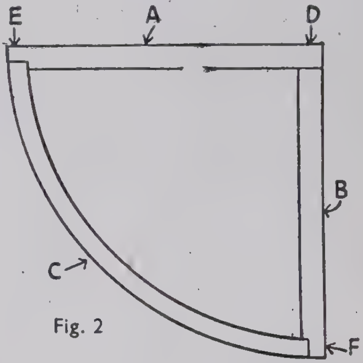


Fig. 2

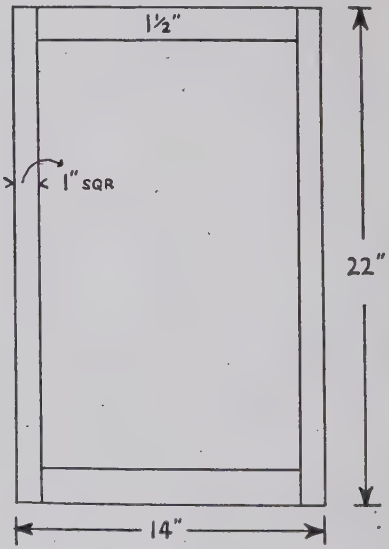


Fig. 3

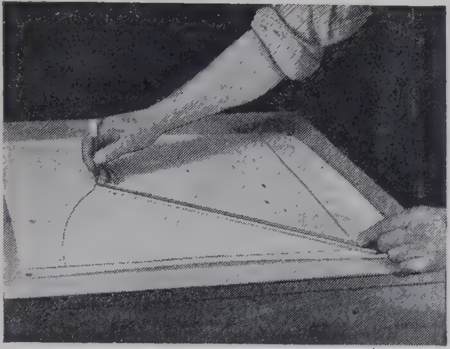


Fig. 4

contour of the front frame members if it is cut so that the grain of the front and back of the ply runs vertically. The sides of this piece of plywood should overlap the outer edges of the vertical posts by $\frac{3}{16}$ in. to cover the edges of the side covering pieces, which are the next items to be fitted. The sides and front pieces are fixed by means of glue and thin panel pins $\frac{5}{8}$ in. long. As the heads of these are so small, there is no object in punching them below the surface as paint will entirely cover them.

The lid is the final item. A pattern should be cut out and pasted to the $\frac{3}{8}$ in. plywood and the piece cut to shape with a pad saw. The edges are then trimmed with a spokeshave, the pattern is removed and the lid hinged either to the right or left of the top framework.

Before applying any finishing medium, glass-paper the exterior smooth. The interior and exterior should be enamelled.

The Stool.—The illustration shown at Fig. 5 represents a bathroom stool built on similar lines to the hold-all; that is to say, it consists of an internal framework, clad with plywood; and a hinged lid. This type of stool has an advantage over the four-legged type as it provides temporary accommodation for soiled towels and proves useful for holding a stock of soap and other bathroom accessories.

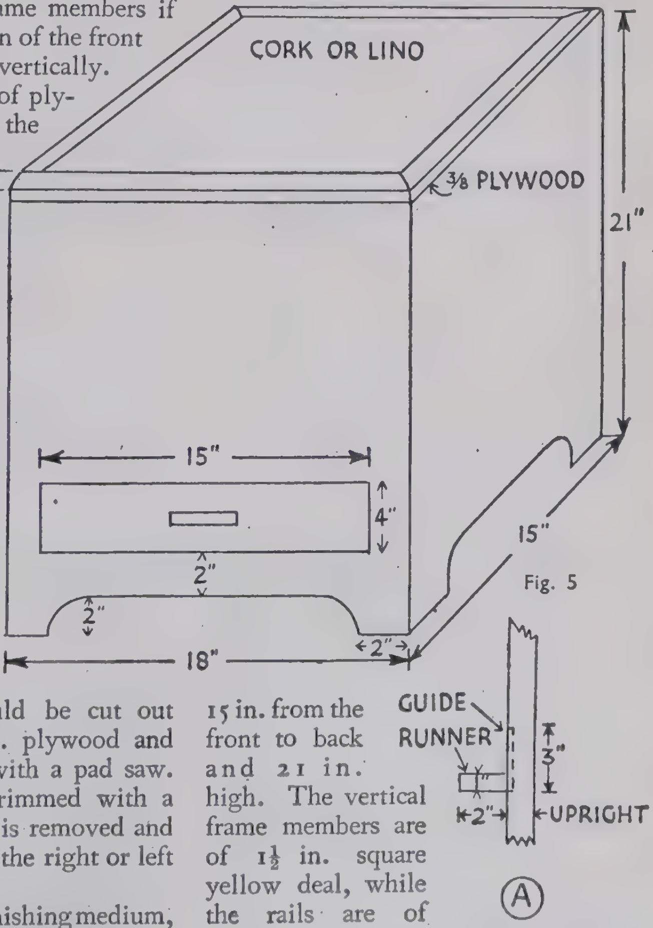


Fig. 5

Reference to the drawing shows that the overall dimensions are 18 in. long, 15 in. from the front to back and 21 in. high. The vertical frame members are of 1½ in. square yellow deal, while the rails are of 2×1 in. stuff. For easy construction, dowel-pins are used for joining the rails to the uprights and the same type of joint is used in the rails that keep and hold the frames apart.

A couple of drawer-runners are fixed between the front and back bottom rails. The runners and guides are formed by screwing a piece of deal ½ in. thick and 3 in. wide, at right-angles to a piece of 2×1 in. batten runners with their guides being fixed by means of screws driven in through the fronts of the rails and into the ends of the runners. The method of forming the runners is detailed at A in Fig. 5.

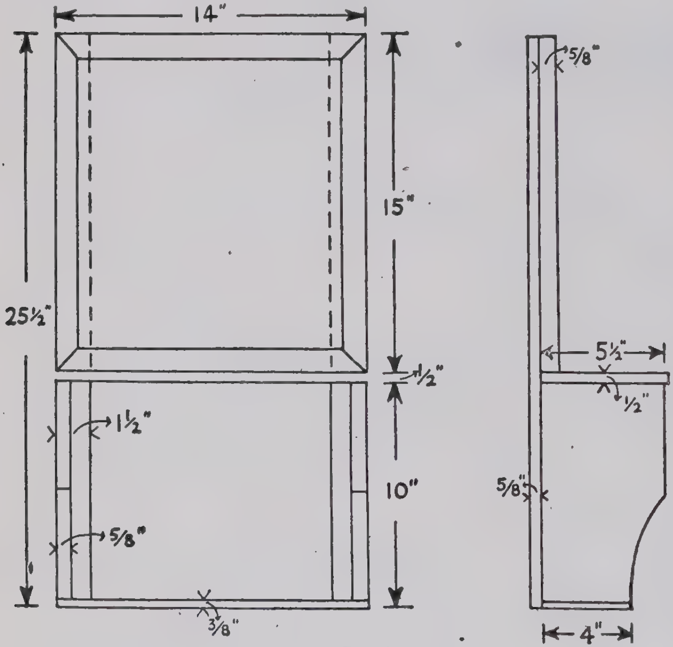


Fig. 6

The drawer is of simple construction and comprises a plain deal front, back and sides, all of which are ½ in. thick. These parts are fastened together by screws and a 3/16 in. plywood bottom is fixed. The sides and back are made 3/16 in. shallower than the front to enable the latter entirely to cover the long laminated edge of the drawer bottom.

The bottom of the compartment above the drawer consists of a piece of ¼ in. plywood supported by ½ in. square fillets glued and pinned to the plywood casing.

The lid, which forms the seat, consists of a piece of plywood ⅜ in. thick around the top and flush with the edges to which is fixed a ¾ in. quarter round beading. This is to enclose the space, which is filled with a piece of compressed cork or a similar kind of material ¾ in. in thickness. A piece of thick cork lino may be substituted for the compressed cork, in which case a ¼ in. bead will be needed. Glue is used for fixing the seating material.

In preparing the plywood with which the framework is covered, do not forget to cut a drawer aperture in the front piece. Glue and thin panel pins are used for fixing the plywood.

Shaving Mirror.—The shaving mirror, Fig. 6, is another useful bathroom accessory of simple design and consists of two essential items—namely, the framed mirror and the shelf unit to which the mirror is fixed. (See page 160).

Start by making the mirror frame. This measures 15 in. long and 14 in. wide overall, as will be seen by referring to Fig. 6, and consists of plain oak moulding 1 in. wide and sold at so much per foot run; if it is obtainable there is little to be gained in purchasing the plain wood and forming the rebates yourself, even if you possess a rebate plane. The ends of the pieces are mitred. Having prepared these mitres, the frame may be assembled with glue and a lost-headed nail at each corner, the head of which is sunk below the surface when the glue is dry and the hole filled with plastic wood.

The shelf unit of yellow deal consists of two sides, each 10 in. long, 5½ in. wide at the top, 4 in. at the bottom, ⅝ in. thick, and shaped as shown.

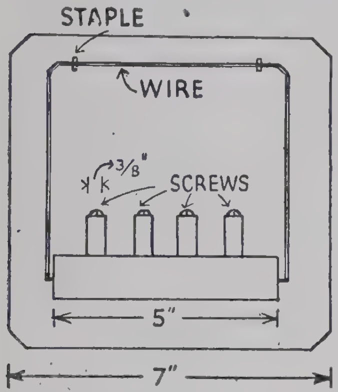


Fig. 7

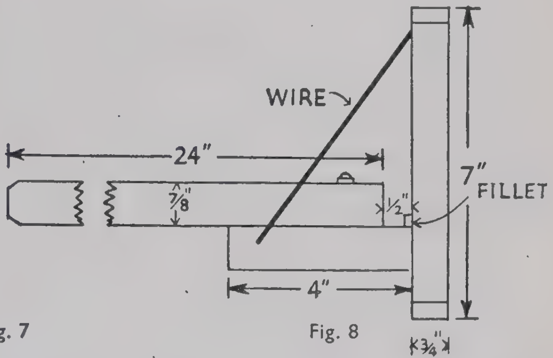


Fig. 8

To ensure accuracy and save time, the two pieces, when cut to size and squared up, can be tacked together and the curved edges cut with a pad saw and finished with a spokeshave.

The two shelves are of the same length, but the upper one is 5½ in. wide and the lower 4 in. The former is fixed by lost-headed nails, while the latter is fastened to the underside by means of 1 in. brass countersunk-headed screws.

The frame supports at the back are 1½ in. wide and ⅝ in. thick and 25½ in. long. They are fixed to the back edges of the sides by 1 in. brass screws. The frame is fixed by the same means.

Before fixing the mirror in the frame, however, it is advisable to give the latter two coats of paint and a final coat of enamel. When dry, the mirror can be placed in position and a backing of 3/16 in. plywood fixed by driving in picture-frame sprigs and then a piece of stout brown paper glued on to cover the aperture and prevent the entry of dust.

To give the front and side edges of the top shelf a finish, suitable lengths of a half-round bead with mitred corners are pinned on, the side pieces being extended to the back edge of the frame support. The beading is not shown in the drawing.

The shelf unit is now ready for enamelling. When dry, the mirror can be attached and fixed to a wall by means of brass mirror plates sold for the purpose.

Collapsible Towel Rails.—At Fig. 7 is seen a collapsible towel airer, preferable to the ordinary type fitted close against the wall, as the arms upon which the towels rest are hung projecting fan-wise, which allows the free circulation of air. (See page 160).

To construct the fitment (see Fig. 8) a piece of hardwood 7 in. square and ¾ in. thick for the base, a piece of similar wood 5 in. long, 4 in. wide and 1 in. thick for the arm support, four strips of hardwood—oak preferred—each 2 ft. long, ⅞ in. wide and ⅜ in. thickness for the arms, will be required.

Also, four japanned No. 6 round-headed screws, 1¾ in. long, for supporting the arms, and a piece of thick galvanised iron wire, a few tinned iron wire staples for fastening the wire and four brass washers to clear the shanks of the fixing screws.

Make the base and arm support first and trim off the sharp corners with a chisel to give the parts a finish.

Drill a hole near each top corner of the base for accommodating the screws which hold the fitment to the wall, and bore a hole of the same diameter as that of the wire, 1 in. deep in the centre and 1 in. from the front, in each side of the arm support.

Then drill a perfectly upright hole ½ in. from one end of each arm, of sufficient size to clear the shank of the round-headed screw. Remove the sharp edges and corners of the strips and screw them to the support, not forgetting to place a washer under the head of each screw. These screws should not be driven in tightly but sufficiently to allow the arms to swing freely, though not loosely.

Bend the wire to shape with pliers and fasten it about 1 in. below the top of the base, using the staples for the purpose, thus forming a hinge. To complete the job, insert the ends of the wire into the holes in the sides of the arm support and fix a thin fillet of wood to form a ledge just above the back of the support when in a horizontal position.

When not required, a gentle pull on the arm support will disengage it from the ledge and allow the arms to hang down vertically. The fitting should be enamelled to match the rest of the articles described.

KITCHEN CABINET TABLE

The cabinet table shown in Fig. 1 will be found useful in a modern kitchen where room for storage is generally at a premium.

As will be seen from the illustration, the space between the legs accommodates two roomy drawers immediately under the top rails, a smaller drawer to the left, and, under it a small cupboard. This could be utilised for storing bread in a suitable enamelled metal bin, while a larger cupboard with double doors occupies the remaining space on the right.

The Construction of the framework and drawers is carried out in yellow deal and plywood is used for facing the top, cladding the ends and back, partition, floor and the cupboard doors. Panelling has been avoided for two reasons. First, because surfaces devoid of ledges are more hygienic, as they do not harbour dust, and secondly, the construction is simplified, inasmuch as no grooves or rebates are required to accommodate the panels, the plywood being simply glued and pinned to the framework. Moreover, such a surface can be given a high-gloss enamel finish which can be washed.

The amount and sizes of material can easily be ascertained from the fully dimensioned drawings of the framework shown at A, B and C in Fig. 2, which illustrate a front elevation, side view and a plan respectively, the latter being given with the top removed to show the framework more easily.

A start can be made by sawing and planing the four legs to size, after which each front face of a leg should be numbered, marking the front left-hand leg **No. 1**, the corresponding right-hand one **No. 2**, the back left and right Nos. 3 and 4 respectively. The legs are then marked out for the mortices which house the tenoned ends of the rails.

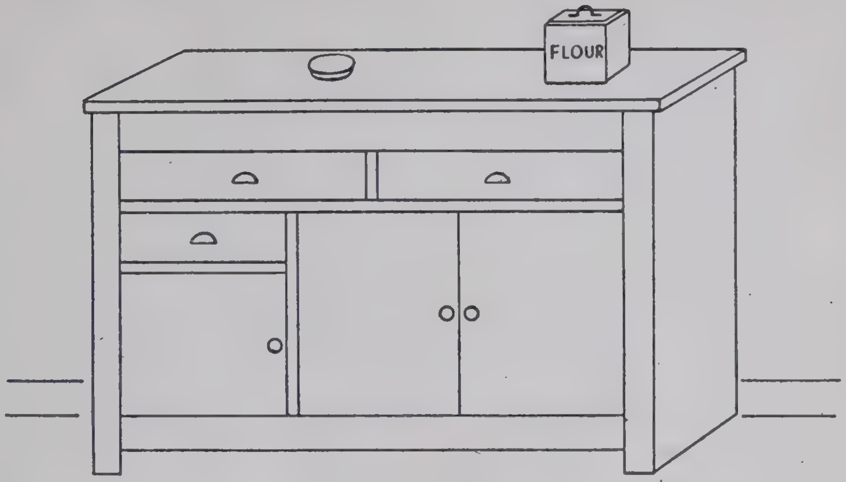

FLOUR

Fig. 1

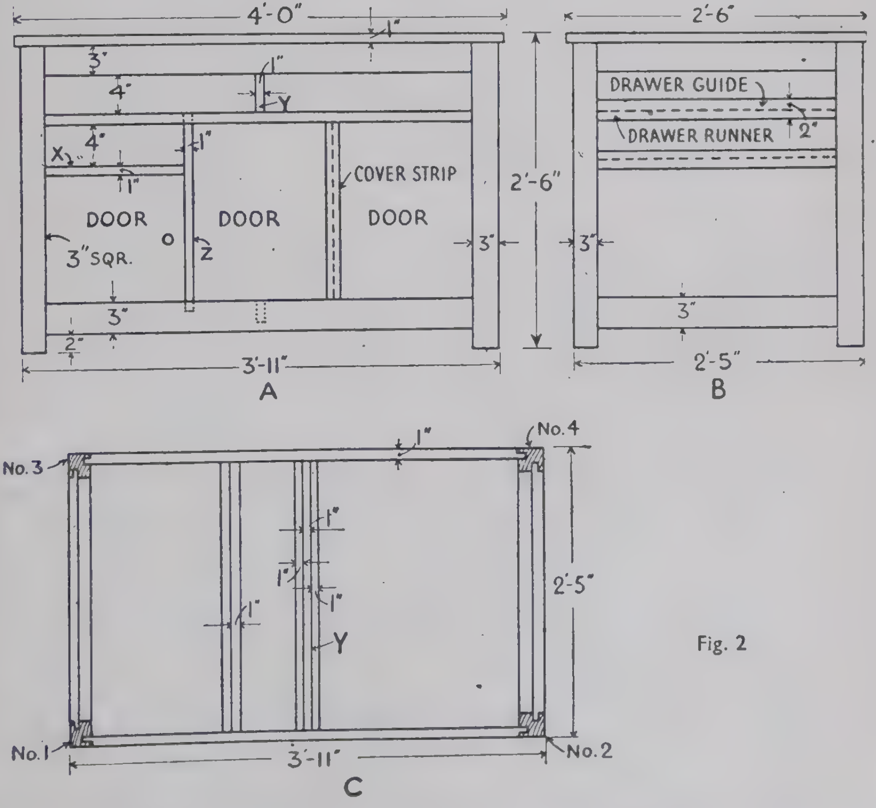

4'-0"
1"
3"
4"
1"
Y
4"
X
1"
1"
COVER STRIP
DOOR
DOOR
DOOR
3"SQR.
Z
3"
2'-6"
3"
2"
3'-11"
A
2'-6"
DRAWER GUIDE
DRAWER RUNNER
2"
3"
3"
2'-5"
B
No. 4
1"
No. 3
1"
1"
1"
1"
Y
2'-5"
No. 1
3'-11"
No. 2
C

Fig. 2

Joining the Rails.—At A in Fig. 3 is shown the mortice and tenon joint used in joining the top rails to the legs, that illustrated at B represents the joint for the bottom rails, and the detail at C shows the method of joining the long drawer rails. Mortices will also be required in the side faces of legs Nos. 1 and 3 to take the tenoned ends of the short drawer rails as indicated at X in Fig. 2, A.

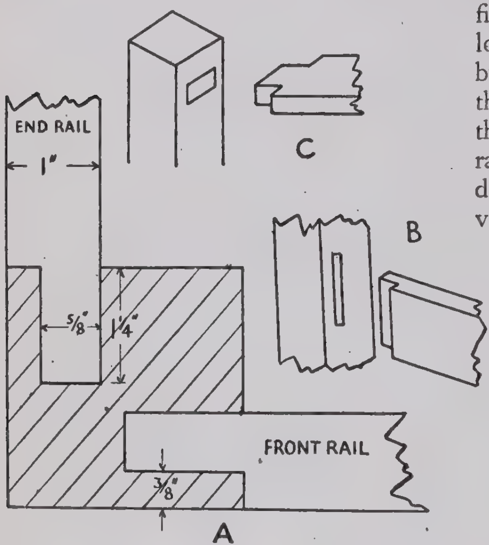


Fig. 3

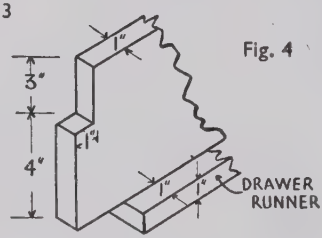


Fig. 4

The mid-rail or cross-piece represented at Y in Fig. 2, A and C, separating the two top drawers is 8 in. wide and the ends are cut away as shown in Fig. 4 to allow the front edge to be flush with the face of the top rail. A piece of 3×1 in. planed stuff is fixed by screws to the lower narrow face of the cross-piece in order to form runners for the drawers as shown.

The partition Z (A, Fig. 2) consists of a frame, the two uprights and horizontal members of which are 2½ in. wide and 1 in. thick. The ends are halved to form halved joints and fastened together with screws. The upper and lower ends are cut as indicated in Fig. 5 to allow the face edges to lie flush with the front faces of the long drawer rails and the front and back rails. The top of the frame is fixed by driving screws through the long drawer rails, the lower portion by driving screws through the faces of the front and back bottom rails, while the interior end of the short drawer rails are fastened by means of screws driven in through the sides of the vertical pieces of the frame.

The intermediate horizontal cross-piece forms the guide for the right-hand end of the small drawer. A piece of 2×1 in. planed stuff is screwed to the guide to form a runner. The top of the latter must of course lie flush with the short drawer rail.

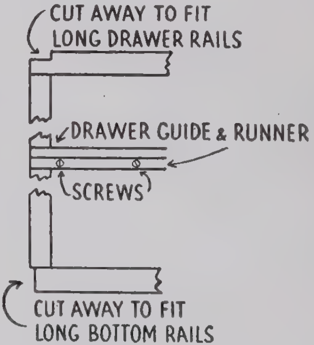

CUT AWAY TO FIT LONG DRAWER RAILS
DRAWER GUIDE & RUNNER
SCREWS
CUT AWAY TO FIT LONG BOTTOM RAILS

Fig. 5

The remaining drawer guides and runners at the leg end of the drawers are constructed by letting pieces of 2×1 in. planed batten into the legs and forming the runners with 1 in. square stuff screwed to the sides as already mentioned.

The framework is finished when a cross-piece, 2½ in. wide and 1 in. thick, has been fixed between the long rails at the bottom to support the floor of the cupboard.

It should be noted that all mortice

and tenon joints should be glued.

The top consists of $\frac{3}{4}$ in. thick boards faced with $\frac{3}{16}$ in. thick alder plywood. The width is made up by gluing several boards a couple of inches longer than the finished length. Allow the glue to dry and then saw to size and finish the edges with a plane.

Using Panel Pins.—The piece is then screwed down to the top of the framework with $1\frac{1}{2}$ in. No. 8 countersunk-headed screws, the tops of the holes being countersunk to allow the screw heads to lie flush or just below the surface. The next operation consists of cutting the plywood facing to size and gluing it down to the top, and further securing it by means of $\frac{3}{4}$ in. panel pins, driven in so that their heads are flush. They should not be punched down below the surface or their object will be defeated by the thinness of the plywood. This point should also be observed when using panel pins for fixing the ends and back.

If ordinary Scotch glue is used for fixing the plywood to the top it is essential that it be applied very hot and its consistency not too thick, also that heavy weights should be applied to the surface and allowed to remain there for at least a day.

The piece of plywood forming the floor of the cupboards is supported by the rails and should be cut so that the narrow ends butt against the plywood sides and the back edges against the plywood back. The front edge covers only $\frac{1}{2}$ in. of the front bottom rail, the remaining $\frac{1}{2}$ in. towards the front forming a rebate against which the lower edges of the door butt.

The Cupboard Doors of plywood $\frac{1}{2}$ in. thick, should be square and an easy fit, otherwise, when finished with enamel, they may not close properly, if at all.

A thin strip of wood $\frac{1}{2}$ in. wide should be glued and pinned $\frac{1}{2}$ in. away from the front edge, to the underside of the long drawer rail to act as a door stop, and a similar strip should be fastened in the same manner to the vertical opening-edge of the right-hand door. This latter piece should project $\frac{3}{8}$ in. beyond the edge to cover the adjacent door-edge to prevent the entry of dust. A door stop should be fitted to the underside of the short drawer rail.

The doors should be hung with $1\frac{1}{2}$ in. long × $\frac{1}{2}$ in. brass butts and suitable fastenings fitted to keep the doors shut.

The Drawers.—The length of these is 2 ft. but could be made shorter if desired. Plywood $\frac{1}{4}$ in. thick is used for the bottom, $\frac{7}{8}$ in. thick deal for the fronts and backs and $\frac{3}{4}$ in. stuff for the sides. The ends of the fronts should be cut away at the back to house the ends of the sides, and the inside faces of the four frame members grooved $\frac{1}{4}$ in. deep and $\frac{1}{4}$ in. wide to take the plywood bottoms. The grooves should not be made nearer the bottom edges than $\frac{1}{2}$ in. as this distance allows sufficient room for gluing a number of triangular blocks to the sides and the bottom of the plywood. These give additional support where strength is needed.

The fixing of the ends and back sheets of plywood is a matter of simple gluing and pinning and should present no difficulty provided the pieces have been cut and trimmed with accuracy.

Before attempting to apply enamel, the doors should be removed and the drawers taken out, and the whole rubbed down with fine glass-paper.

A priming coat of good lead paint may then be given, rubbed down with glass-paper when dry, dusted, and another coat of flat paint applied, which, when hard, must also be lightly rubbed down. This is followed in due course by the final coat of enamel, which must be applied in a dustless room whose temperature should not be below 60 deg. F.

VEGETABLE SAFE

The safe shown in Fig. 1 is easy to construct and is made of red or white deal.

About 90 ft. of 2½×1 in. battens will be required. Plane and square these up and cut the top and bottom also out of pine or other light wood, size 1 ft. 10 in.×12½×1 in. Square these, then cut the battens up into eight 3 ft. 2 in. lengths and square their ends.

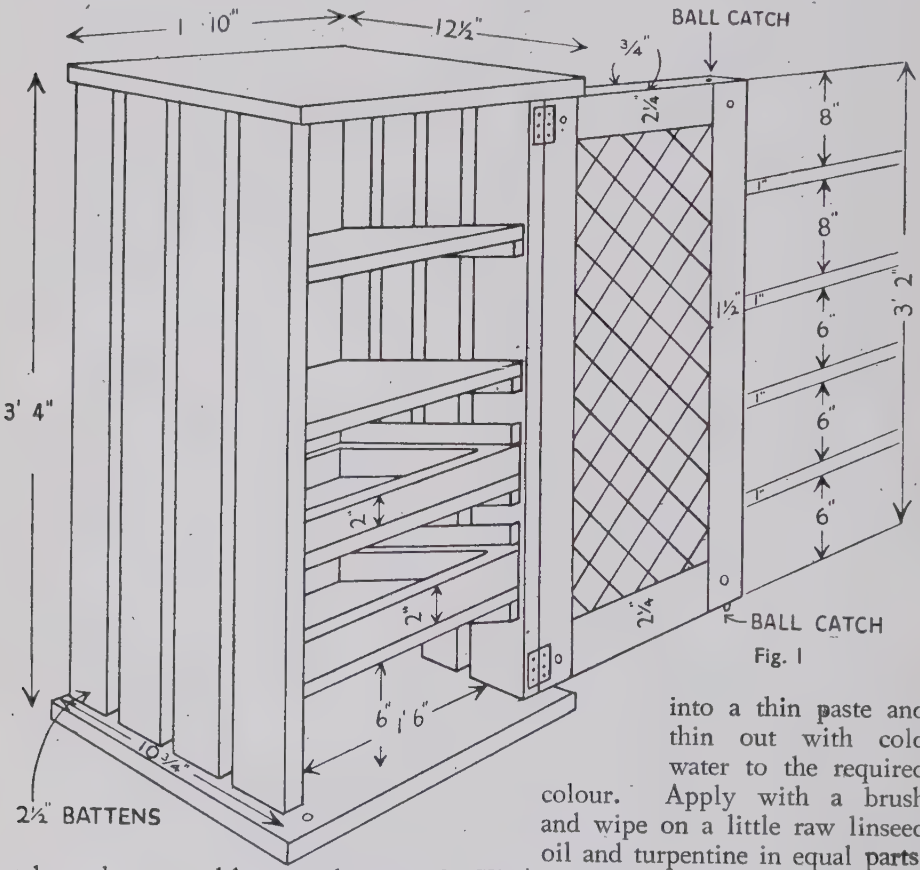


Fig. 1

These eight battens and the top and bottom can at once be assembled by screwing and countersinking from the top and bottom.

Before doing this, it is better to stain them to the required colour. A medium brown stain will be best as this does not show up the dirt. Mix some vandyke brown powder and .880 liquid ammonia into a thin paste and thin out with cold water to the required colour. Apply with a brush and wipe on a little raw linseed oil and turpentine in equal parts. The oil prevents the stain coming off when the safe is washed.

Use of Battens.—Find the position for the screws, bore and countersink below the surface and screw the eight battens at top and bottom together.

Screw four battens across the back to keep the structure rigid and for the trays to shut against, about 2½×1 in.

These can be screwed from the sides as they are in the clear.

The positions of these battens are immediately behind the shelves and trays.

Nail on a sheet of perforated zinc or small-mesh wire netting from the back of the safe. This completes the back.

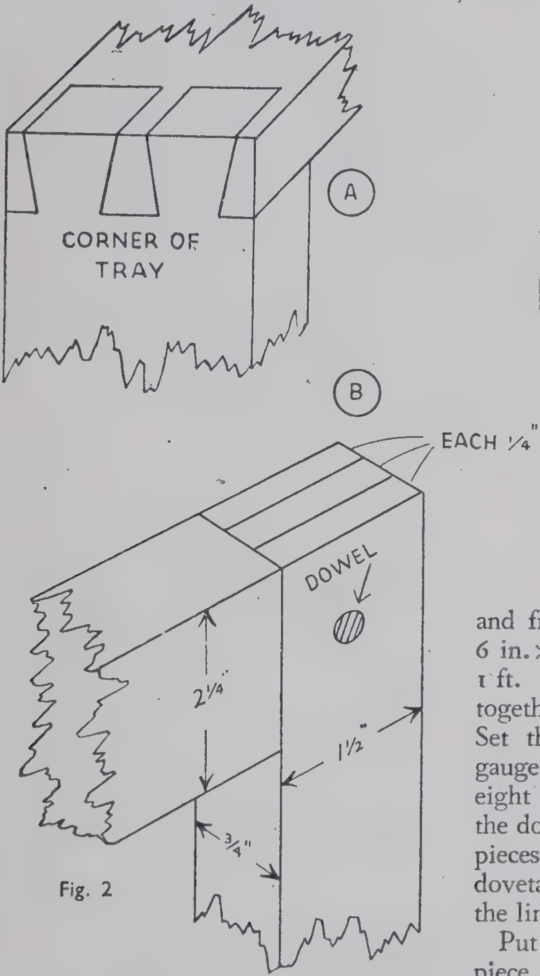
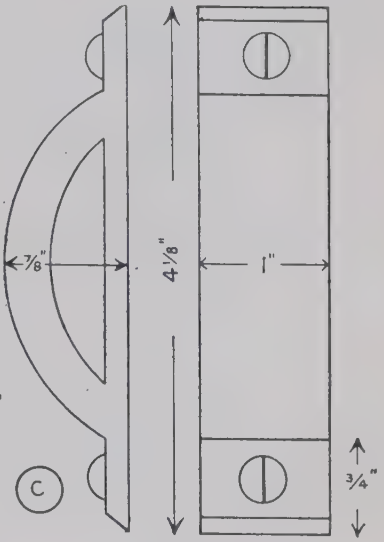


Fig. 2



Now square up twelve battens to the required length and screw them on the sides, so that the shelves may rest upon them. These battens are set back ¼ in. from the front edge.

In the case of the lower two trays, two battens will have to be screwed to each side, one above and the other underneath the trays, to form runners for the trays, as shown in Fig. 1. The shelves can be made of 2½ in. battens and screwed in from the sides.

Now make the two trays. Plane up sufficient wood 2 in. wide × ½ in. thick, and from it cut four pieces each 1 ft. 6 in. × 2 × ⅝ in. thick, four pieces each 1 ft. 6 in. × 9½ × ⅝ in. Dovetail them together as shown in detail at A in Fig. 2. Set the marking gauge to ⅝ in. and gauge lines round both ends of the eight pieces. Mark out the sockets of the dovetails on the four front and back pieces and saw them down with a dovetail saw, keeping the saw cuts inside the lines.

Put the short pieces in the vice, one piece at a time, and, placing the long piece in position and holding it firmly, put the saw into the cuts made and draw it towards you, thus scratching the lines on the end of the short piece. Complete marking out the pins, which are left up, on the short pieces. Saw down outside the pins and chisel out the wood between them, working alternately from the front and back.

Chisel out the sockets and fit and glue up these two frames. Then glue, pin or screw on some little $\frac{3}{8} \times \frac{3}{8}$ in. strips inside, and **level** with the edge so that you can drop in the $\frac{5}{16}$ in. thick plywood bottoms.

This method of fitting the bottoms is better than grooving them in, as they can be taken out and washed when necessary.

Trays and Door.—Plane up the outsides of the trays and fit them so that they run easily. Screw on the four battens that form the runners.

The door shuts over the front edges of the sides, so that it allows the trays to be pulled out.

The size of the door is therefore 3 ft. 2 in.$\times$1 ft. 8 in.$\times \frac{3}{4}$ in.

Square up two pieces 3 ft. 2 in.$\times 1\frac{1}{2} \times \frac{3}{4}$ in. and two others 1 ft. 8 in.$\times 2\frac{1}{4} \times \frac{3}{4}$ in. to form the stiles and rails.

Gauge the lines for, and square with a chisel, the shoulders of the tenons on the short pieces as shown at B in Fig. 2 and draw the mortice lines on the long pieces with a pencil. Saw down the tenons and mortices, cut out the waste and fit the frame together. Try for size and plane off surplus wood until it is only a shade too large.

This is easily done before gluing, as each piece may be planed off on the bench. Now glue the framework together and allow twelve hours to dry. Then, with a fine-set sharp plane, take off from the edges a few fine shavings so that the door opens easily and is flush with the sides.

To make a good job of this frame, put a $\frac{3}{8}$ in. diameter beech dowel through each tenon, as shown.

Put on the hinges, sinking them in the edges of the safe and frame of the door; that is, half the thickness of the hinge in each case. Put them on the frame of the door first.

Purchase a piece of perforated zinc, size 2 ft. $11\frac{1}{2}$ in.$\times$1 ft. 6 in., and paint it in sympathy with the colour scheme of the kitchen. Zinc takes paint or enamel well, but the colouring medium must not be too thick.

When it is painted, allow it to dry and fix it on the inside of the door.

Now purchase two $\frac{3}{8}$ in. ball catches, drill holes and tap them well down in the positions shown in Fig. 1 on top and bottom of the door.

Next, square up the wood for the handle, C in Fig. 2, size $4\frac{1}{8} \times 1 \times \frac{7}{8}$ in. A piece of hardwood is best for this. Square and saw at the two lines across the front and gauge and saw out the two ends, gauging $\frac{3}{16}$ in. from the back. Then round over the front with a chisel as shown. Bore two holes and screw and glue it on to the door.

Hinge the door, gouge out small hollows on top and bottom to take the ball catches and finish the rest of the staining.

A $\frac{3}{8}$ in. stop chamfer can be put round the inner edges of the door if desired.

NURSERY FIRE GUARD

A FIREGUARD should have a heavy base to prevent the child from pulling it over, and as an additional safeguard should be hooked to the wall.

The solid oak fireguard shown in Fig. 1 is suitable for protecting a small child, but the height and length may be increased to suit individual requirements.

It is best to make the fireguard big enough so that it can be placed outside the existing fender.

Where there is no fender it is advisable to pin on metal strips as shown, although if the wood is treated and made fireproof, as described at the conclusion of this article, there is no real necessity for doing so.

It is best to make the frame of the fireguard in oak and the rails of birch.

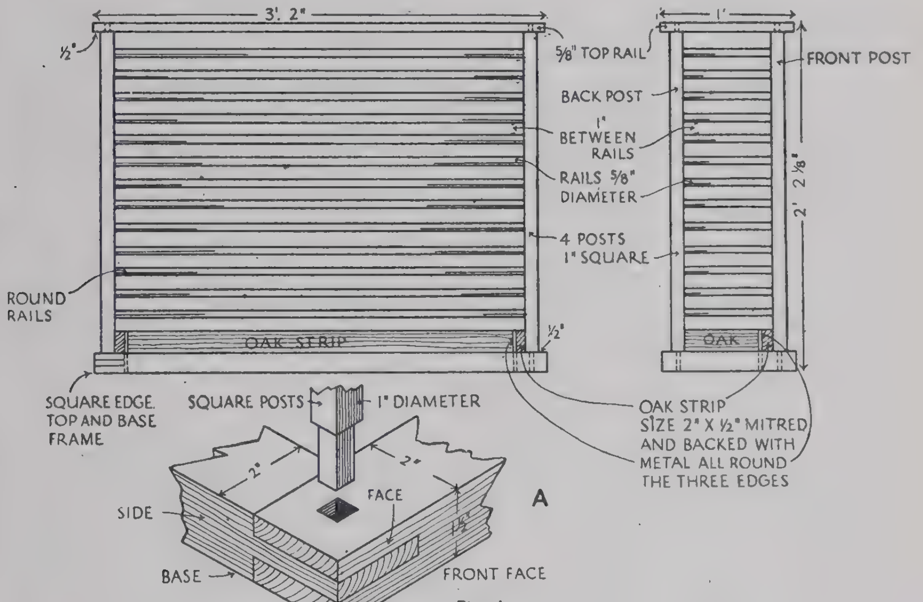

3' 2"
½"
⅝" TOP RAIL
1'
FRONT POST
BACK POST
1" BETWEEN RAILS
RAILS ⅝" DIAMETER
2' 2⅛"
4 POSTS 1" SQUARE
ROUND RAILS
OAK STRIP
½"
OAK
SQUARE EDGE TOP AND BASE FRAME
SQUARE POSTS
1" DIAMETER
OAK STRIP SIZE 2" X ½" MITRED AND BACKED WITH METAL ALL ROUND THE THREE EDGES
2"
2"
FACE
1½"
A
SIDE
BASE
FRONT FACE

Fig. 1

Construction.—Start with the base by squaring up one piece of oak 3 ft. 2 in.×2×1½ in. for the front, and two pieces each 1 ft.×2×1½ in. for the two sides.

Now set out the bridle joints "open mortice and tenon," on each corner, as shown in detail at A. To do this, divide the thickness of the wood into three parts and gauge lines round the four ends that go together.

Then measure 2 in. from all these four ends and square round pencil lines.

Saw down on the insides of the lines of the front piece and outside the lines on the two side pieces, chisel out the waste and fit together.

Do the same with the top three-piece framework. This component is the same size as the base, but only ⅝ in. thick.

Fit this together and see that the two frames are exactly the same size, then glue them up and leave them for twelve hours to dry.

Now saw and plane up the four corner posts, and note that they are square in section.

The size of each post is 2 ft. 2½ in.×1×1 in. Measure a distance of 1¾ in. from the left-hand end of each piece and square a line all round with a chisel, then measure 2 ft. from this line and square another line all round these lines to indicate the shoulders of the tenons. Saw these shoulders down ⅛ in. and pare off, thus leaving the "stub" tenons ¾×¾ in.

Now, taking care to centre by diagonals the true centre for the mortices both on the top frame and base frame, set them all out to ¾×¾ in.

Then, with a ⅝ in. centre-bit, drill holes through, working from both sides in each case to prevent splitting the wood.

Next, square the round holes by paring the wood from each side with a very sharp chisel, fit in the posts and note that the tenons project a little.

Identify each post with the framework it belongs to by marking AA, BB, CC, DD, and so on.

With the aid of a pencil, set out on the four posts the centres for the round rails in the following way: Work from the base and first measure 2 in. from the shoulders and square all round for the oak strip. Next space out the centres for the rails and square lines round. Now gauge a faint line down the centres of the two inner sides of the front posts and on one inner side of the back posts. Where the lines cross are the centres for drilling. Purchase enough $\frac{5}{8}$ in. diameter birch dowelling to make all the rails and saw them up carefully to 2 ft. 11$\frac{1}{2}$ in. in length for the long rails and 9$\frac{1}{2}$ in. long for the side ones.

On a spare piece of wood drill a hole $\frac{5}{8}$ in. diameter and fit one of the rails (dowels) to try it out.

Drill all the holes on the two inside faces of the front posts and the one inside of each back post, to $\frac{1}{4}$ in. (full) deep. This little extra depth is to give room for the glue which is forced to the bottom of each hole.

Before proceeding to glue up, clean up all the work with Nos. 1$\frac{1}{2}$ and 1 glass-paper, not forgetting to round off all the sharp edges, both of the posts and the top and bottom frames.

Gluing Up.—Proceed by gluing up the two sets of end rails, test for squareness and see that the posts measure 11 in. from "out to out" and prove it by applying each end to the mortices in the frames. Wash off any surplus glue and leave at least twelve hours to dry.

Then glue in the front rails, the top frame and the base and wash off all glue with hot water. Stand the guard up and test for squareness. Leave the work for twelve hours to dry and saw off the projecting tenons.

Cut out three strips of oak, 2 × $\frac{1}{2}$ in. and fit them "in the clear" above the base as shown. Take them out and pin some metal strips inside—then pin in from the ends.

To Render the Wood Fireproof.—first wash it in a solution of hot salt and water, then apply oil and turps. Stain to the colour required.

WASTE-PAPER BOX

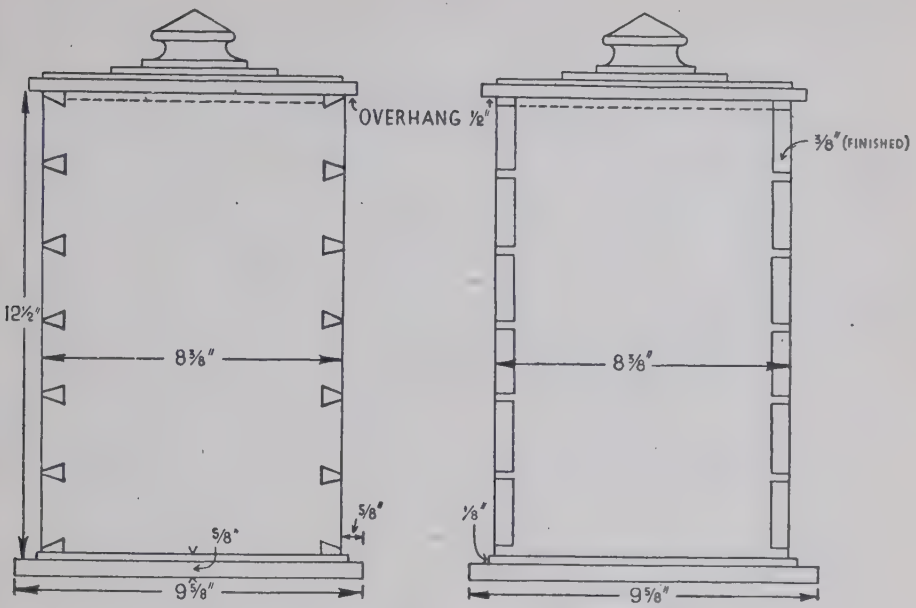
THE solid oak waste-paper box shown in Fig. 1 is best made of Austrian wainscot oak out of $\frac{1}{2}$ in. sawn stuff for the sides, $\frac{3}{4}$ in. stuff for the bottom and 2$\frac{1}{2}$ in. stuff for the solid top.

Proceed by sawing, planing and squaring up the following material.

Four pieces for the sides, each $8\frac{3}{8} \times 12\frac{1}{2} \times \frac{3}{8}$ in. (note the grain runs the short way); one piece for the bottom, $9\frac{5}{8} \times 9\frac{5}{8} \times \frac{5}{8}$ in.; one piece for the top, $9\frac{3}{8} \times 9\frac{3}{8} \times 2\frac{1}{2}$ in.

The best way to square up the four sides is to plane up a piece of oak 2 ft. 10 in. long × 12$\frac{1}{2}$ in. wide × $\frac{3}{8}$ in. Shoot (square) the right-hand end. With the face-edge nearest to you, measure off from the right 8$\frac{3}{8}$ in., then square a line across with a chisel or sharp marking knife. Now looking on the right of the saw and keeping the cut line in, make a tenon saw cut $\frac{1}{8}$ in. deep.

This will enable you to see exactly how wide the saw cut is.



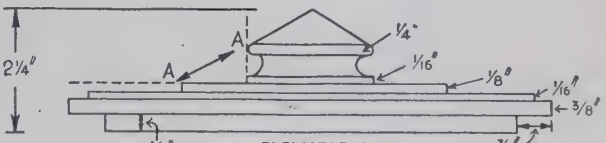
FRONT VIEW Fig. 1 SIDE VIEW

Then measuring 8⅜ in. again from the left-hand edge of the cut just made, square across again and proceed until you have four pieces marked and partly sawn.

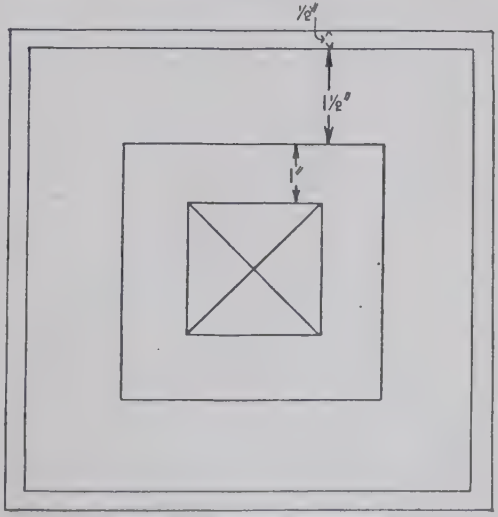
Saw through the cuts, shoot the ends of each piece, set the marking gauge to ⅜ in. and gauge round both ends of all four pieces.

Set out the dove-tails as shown in the elevation, Fig. 1. Saw them down, keeping the cuts on the waste side of the lines.

Indentify all pieces by marking 1—1, 2—2 and so on. Then with the "side view" piece, Fig. 1, fixed in the vice with one of its long edges just above the bench-top level, place the side piece in position and, with the aid of a friend,



ELEVATION



PLAN

Fig. 2

put the point of the tenon saw into the cuts already made, draw it towards you, thus scratching a replica of the dovetail on the side. Complete the marking by squaring pencil lines down the sides, then saw down outside these lines and chisel out all the wood between the pins on the side pieces and the sockets on the front and back.

Fit the four sides carefully and assemble. These four sides may now be glued, cramped and left for twelve hours to dry. When gluing, test carefully for squareness.

Now gauge a line ½ in. in from the edge all round on the face-side of the piece of wood forming the bottom, and then gauge ⅛ in. down from the face on the edges and rebate down as shown.

Screw the bottom on and countersink the screw-heads.

The loose top, details of which appear in Fig. 2, could be made out of two pieces of wood, but it will be best to make it from a solid block.

Note that the "face side" is the bottom of the lid. Set the marking gauge to ⅞ in. and scribe a line all round on the face side "underside." Then from the face side gauge a line ½ in. down on the edges, all round. This will form the rebate later on, but do not saw it out yet.

The next thing is to get rid of the bulk of the wood, so as to leave the centre block standing up square.

Proceed by gauging 1⅛ in. from the face side and round the edges. The gauge should be set full "$\frac{1}{16}$ in." to allow for shouldering down afterwards.

Now gauge a line 3 in. in from the edges, and with a tenon saw very carefully saw out the four waste blocks of wood, keeping all your gauge lines "well in."

It is best to finish this surface and edges now, indicated at A in Fig. 2, with a fine set and sharp shoulder plane.

The Handle.—While you still have a flat surface to grip in the vice, mark and gauge the profile of the handle on the front and back "i.e., with the grain sides."

With a gouge, hollow through across the grain, taking care to leave the little $\frac{1}{16}$ in. fillet as shown.

Then with a sharp ¾ in. chisel having a long bevel, pare through the two sides of the pyramid, by working three parts of the way from the front, then quarter of the way from the back. This is to prevent breaking the end grain. Shape the front and the back in the same way and round off the edges.

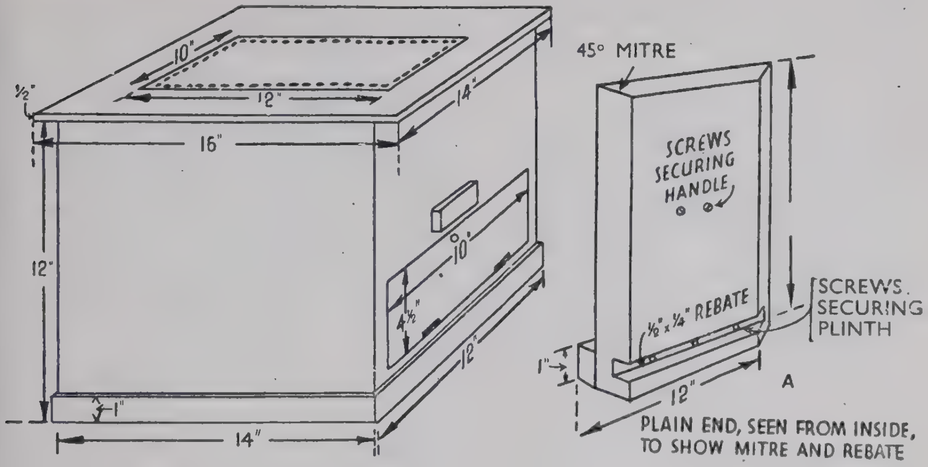
Next gauge and shoulder down the other two fillets and finally saw out and finish the rebate underneath and fit it.

Clean up carefully all these mouldings with Nos. 1½ and 1 glass-paper and then finish with wax.

COAL BOX WITH METAL CONTAINER

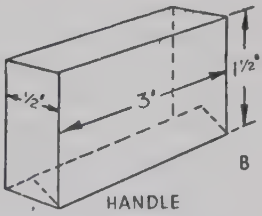
THE dimensioned drawings shown in Figs. 1, 2 and 3 illustrate a coal box in wood with a removable, metal container. The top forms a padded seat. The container is designed with a false grid bottom, allowing the larger lumps of coal to rest upon it, while slack falls through, and may be shovelled up through the door in one end. The seat, door and grid container may be omitted, and the construction simplified accordingly.

The wood case may be made either in solid oak, preferably of the less expensive and more easily worked varieties (e.g., Japanese or Austrian)



COAL CABINET WITH SHOVEL DOOR
OUTER WOOD CASE IN ½" STUFF

PLAIN END, SEEN FROM INSIDE, TO SHOW MITRE AND REBATE



HANDLE

Fig. 1

or other hardwood, or in laminated wood faced with oak (or other) ply, in either case of ½ in. thickness. If solid oak is employed, it may be necessary, if difficulty is found in procuring boards of sufficient width, to butt-joint and glue, side by side, boards of about half the specified widths, so as to obtain the sizes. On the other hand, if laminated wood is used, the edges of the top, the plinth and the handles will require facing with ply, neatly mitred.

The Joints.—Reliance is placed generally upon simple mitred joints which, if accurately cut and surfaced, glued and held in cramps until set hard, will give ample strength; the bottom, however, is cut ⅜ in. larger each way than the internal dimensions of the case and is fitted and glued into a ½×¼ in. deep rebate cut on the inner sides of the two sides and two ends, ¼ in. above their lower edges as shown at A in Fig. 1.

But first the plinth is glued and screwed on (from the inside of the rebate) with three ¾ in. screws, countersunk.

The top is hinged to one of the sides and may be fitted, inside, with a brass quadrant stay and stop to hold it open, if desired. The padded seat is stuffed with horsehair or flock and upholstered with leather or leather-cloth of any desired shade, and is held in place with a fillet of the same material, run round the edge and tacked to the wood with brass-headed or leather-covered nails at intervals of, say, 1 in.

The handles, B in Fig. 1, are rectangular blocks of wood, 3×1½×½ in., with a finger groove gouged in the bottom edge, glued and held on to the ends of the cabinet with two ¾ in. screws driven from the inside. It will save some fiddling mitre work with ply, if these are cut out of solid timber.

The shovel door is hinged at the bottom to fall outwards, and is fitted in the middle of its top edge, with a ball-spring catch, to hold it in the closed position, and with an external button with which to open it.

The Coal Container.—The metal container is made of flat galvanized sheet iron of twenty or twenty-two gauge (black plate is not recommended, since even if painted, the moisture almost always present in coal, eats it into holes comparatively rapidly). The ends are tapped ½ in. over the sides and rivetted.

The top rim is reinforced with No. 8 W.G. galvanized wire bent to a rectangle, over which the edges of the sheet forming the sides and ends are tapped. The top and bottom of the shovel-hole are similarly reinforced, as shown in Fig. 2 by two lengths of the same wire.

This may also be used for the cross bars forming the grid; but this size is barely substantial enough, and it would be preferable to use eight lengths of No. 7 W.G. or even $\frac{3}{16}$ in. galvanized wire here.

The carcase may be marked and cut out of one sheet as shown in Fig. 3, allowing ½ in. for all laps, and the two sides and one solid end then bent up at right-angles and the tops beaten over and secured with, say, six rivets down each side (it is not necessary to rivet the top laps over the wire stiffener). The aperture end will obviously be separated in the process of cutting, and should have its edges lapped and rivetted to the sides of the container in a similar manner to the solid end, but with the substitution of two stiffening cross wires for four of the rivets.

Before bending up, however, there are two things to do: form the aperture for the shovel-hole, and mark the centres for the holes to fit the various wires and rivets. The metal is not entirely removed from the aperture, A, Fig. 3, but cut at what will be the bottom and the two sides of the hole, and the flap so created is bent inward at an angle of approximately 120 deg. The centres for the wires—eight for the grid and two stiffeners—also for the rivets, including those holding the handles, should be carefully set out in accordance with the dimensions, but the holes should not actually be drilled until the carcase has been bent up into its final shape, and all is ready for riveting. Work on the rivets first and leave the wires to the last.

Wiring the Bottom.—The drilling should be carried out with drills of exactly the diameters of the wire and rivets to be employed. The wires themselves should be cut to a length equalling the full outside width of the container, or even a shade more, and when driven into position the ends are secured by liberally sweating them with solder. The bottom of the flap is next lapped from above downwards and round the last grid-wire seen on the right of the illustrations in Fig. 2; lastly the ½ in. strip left at the bottom of the shovel-hole is similarly tapped around its stiffening wire.

There now remains to make and fit the collapsible handles. The two oval loops are bent up from the No. 8 W.G. wire, and each will require a sleeve cut out and made from the galvanized sheet, to be drilled, as shown, with two holes for rivetting on the inside of each end of the container, near the top, in the centre.

If the sizes given are carefully followed, the container should prove an easy fit in the wood cabinet, ¼ in. clearance having been allowed in every direction.

Nevertheless, it is advisable that the container should be made, complete, *before* the wood for the cabinet is cut, and the one measured against the other, to avoid any possibility of a misfit.

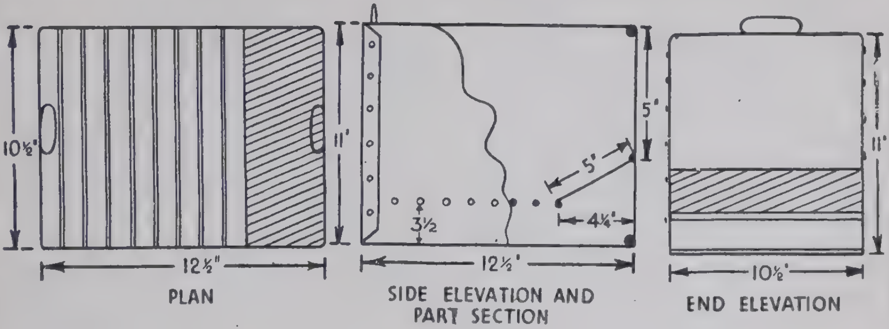
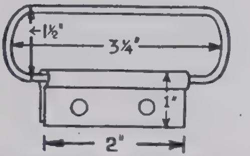
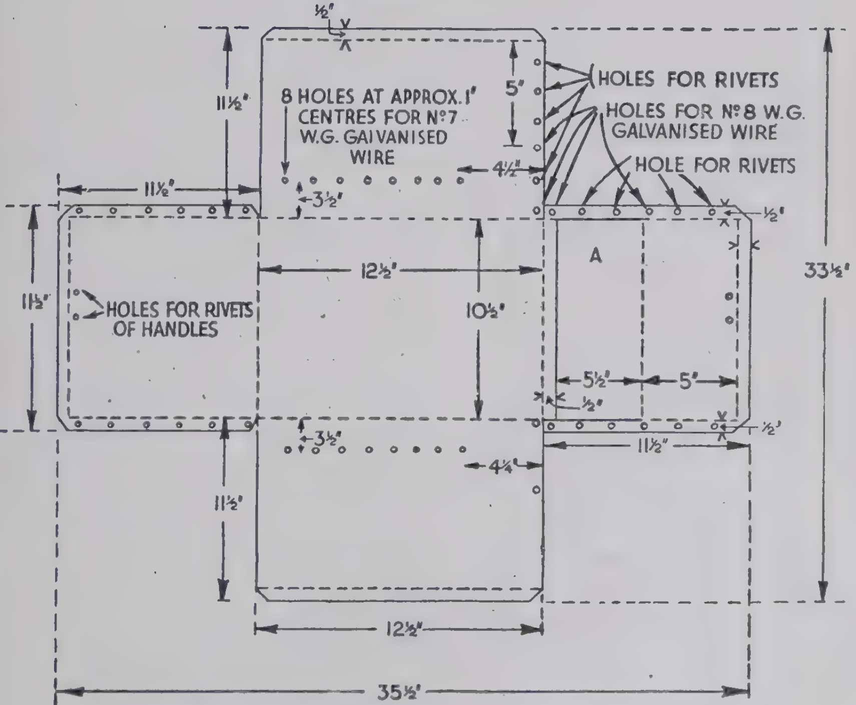

10½"
11"
12½"
PLAN
5"
5"
3½
4¼"
12½"
SIDE ELEVATION AND PART SECTION
11"
10½"
END ELEVATION

Fig. 2



HANDLE AND SLEEVE


½"
11½"
8 HOLES AT APPROX. 1" CENTRES FOR Nº 7 W.G. GALVANISED WIRE
5"
HOLES FOR RIVETS
HOLES FOR Nº 8 W.G. GALVANISED WIRE
HOLE FOR RIVETS
4½"
11½"
3½"
½"
11½"
12½"
10½"
A
33½"
HOLES FOR RIVETS OF HANDLES
5½"
5"
½"
½"
3½"
4¼"
11½"
11½"
12½"
35½"

CONTAINER: SETTING OUT (THE DOTTED LINES SHOW BENDS)

Fig. 3

WOODEN COAL BUNKER

A WOODEN coal bunker to hold a ton or half-ton of coal can be constructed according to the details given in the accompanying drawings. It is made of deal scantlings for the frame and ¾ in. weather boards for the outer covering. Fig. 1 shows the bunker complete and Fig. 2 the framing.

The structure is exactly 4 ft. high at the front and 5 ft. high at the back to allow sufficient slope in the roof to carry off water. The framing consists of posts 2½ in. square of rough, good quality, sawn timber. They are connected by side and end rails, and the top members are at an angle to form a support for the roof. The bottom rails are at ground level and the posts project 2 in. below the lower edges of these rails in order to allow them to be bedded in a cement floor, which is the only suitable base for an outside coal bunker.

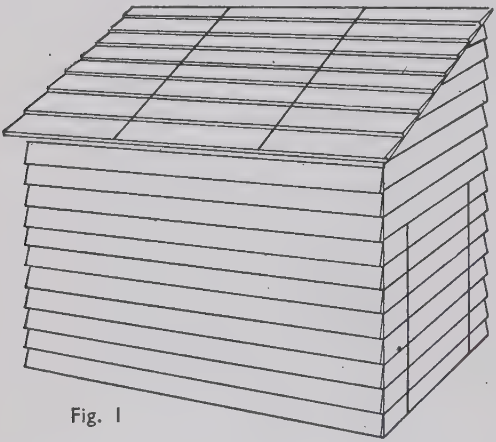


Fig. 1

The side and front middle rails are 2 ft. 6 in. and the back 3 ft. 6 in. from the ground and are of 1×2 in. stuff let in flush with the outside faces of the posts, the joint being shown in Fig. 3. They are fixed with galvanized nails or may be secured with galvanized screws. The three front posts can be laid alongside each other and marked and the recesses for the top, middle and bottom rails cut across with a saw and the remainder removed with a chisel. The same can be done with the three back posts. The end rail is similarly cut to lie flush with the middle rail.

The Back and Front.—The end middle rail and bottom rail, at the end most convenient for the situation the bunker has to occupy, are connected by uprights A and B halved in at the top and bottom. These are central with the width of the end and 14 in. apart. They form an aperture for the removal of the coal when the supply is getting low. The two intermediate sloping members form an opening in the top of the bunker for shooting coal in from sacks and also for the removal of coal until it is reduced to a level which enables it to be shovelled and heaped to the far end of the bunker and conveniently withdrawn from the end opening. The end opposite the small door could have its top horizontal rail fitted just below the top of the front post, as shown, and a big door fitted to fill that space. This arrangement would allow one to get into the interior for the purpose of shovelling the coal to the opposite end when the supply gets low, as the physical effort necessary to reach the end from the small door would be heavy. This is, however, a refinement which may be incorporated and will be dealt with later.

The framing having been constructed, it should be moved to the place made ready for it. This will be a flat surface

6×4 ft. prepared and levelled and with 2 in. of concrete laid down. Holes should be sunk for the six posts and these should be inserted as the framing is lifted into position. The whole levelled and the holes filled with cement. An inch layer of sand and cement should be laid over the surface and well into the holes around the posts.

If the bunker has to back up against a wall or fence the back weather board should be laid along the back and nailed with zinc or galvanized nails before the framework is cemented in position.

If the bunker be backed up to a brick wall, neither the back boarding nor the middle post and the rails will be required; the end posts being simply nailed to the wall with flat-head staples driven in at the side, but a rail to support the back of the roof will have to be fixed along the wall at the height of the back end posts. The top of all the posts must be sawn off to suit the angle of the roof, and the top edges of the front and back rails will also have to be bevelled to the same angle.

Fixing Weather-boards. — The weather-boarding should be laid across the front and the end to be entirely closed, beginning at the bottom with the thick edge downwards. The boards should be 5 in. wide and overlap an inch so that twelve weather-boards will therefore be required for the front. The end opposite the aperture will be similarly treated until the boards reach the top of the front post, after which the boards will have to be cut to an angle at the ends as they continue to the height of the back post until they line up with the top edge of the end top rail. Similarly in the aperture end they will be laid from the bottom up each side of the short posts, but not reaching to their inside edge. They should be 1 in. from the inside edge to allow a space for the door to close up against the post (the door being made of similar weather-boarding), but above the door-head they should be continued all along and tapered off at the ends to match the fall of the roof and extend right up level with the top of the roof end rail.

In the same way the boarding will be fixed on the top. It should start at the bottom with the thick edge of the weather-board overlapping 2 in. to clear the rain from the front, and should extend beyond each end of the bunker for 2 in. for a similar purpose. This top boarding should be fixed on each side of the aperture and the inner ends flush with the two centre top cross-pieces.

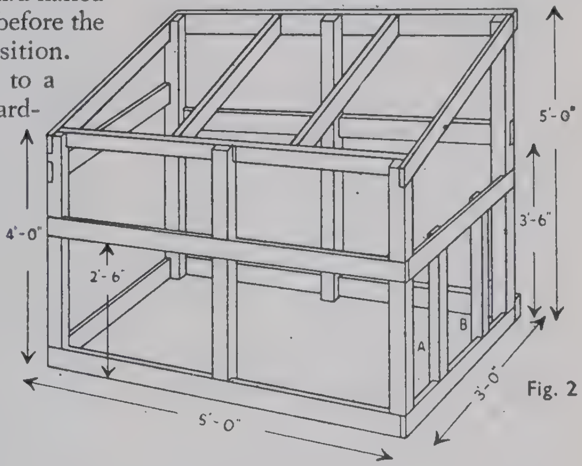


Fig. 2

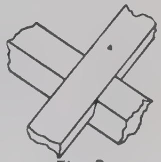


Fig. 3

The back of the hatch rests on the top back rail. It consists of weather-boards, as shown in Fig. 1, on two battens of 3×1 in. stuff. The ends of the battens at the back should be cut away so that the top weather-board rests upon the face of the top back rail (or the rail on the wall in the case of a lean-to bunker) and the bottom ends treated in the same manner to enable the front top board to rest on the front top rail of the bunker, while a fillet nailed to the sides of the sloping pieces keeps the cover in position. The cover does not need any hinges. It is simply lifted to one side when the bunker is being replenished and replaced afterwards.

The end door is made with plain $\frac{3}{4} \times 5$ in. weather-boards nailed on two battens. The width of the door is equal to the width between the inside ends of the covering boards and rests against the uncovered parts of the two posts which form the opening.

The battens fit between the rails and a pair of cross garnets are screwed through the top board into the battens and to the weather-board above it. Suitable wooden buttons fixed just above the lower edge of the weather-boards will keep the cover closed when not in use.

Two or three applications of creosote should be given to the exterior as well as the interior of the bunker to give it a finish and preserve the wood.

CUTTING DOWN A WARDROBE

The tendency of the day is in the direction of small, labour-saving, houses and flats, and furniture is being built to correspond. Such furniture is often difficult to acquire second-hand, and when offered at auctions is quickly snapped up. The heavier pieces, on the other hand, constructed to meet the needs of an earlier age, when taxation was lower and problems of domestic labour scarcely existed, are often to be had at reasonable prices.

The labour employed in breaking them down to one's own requirements, is therefore repaid. Apart from that, the necessity may often arise in a household, of suiting a piece of furniture to fit a different room from that in which it has formerly stood. It is not unusual to find when moving furniture from one room to another that a piece is too big to go through the doorway. This article deals with one specific example—a wardrobe.

The wardrobe, Fig. 1, was one of those models measuring some 6 ft. 9 in high, consisting of an upper part or cupboard with a large drawer underneath. Unfortunately the cupboard and base containing the drawer were made in one piece and not detachable as are a great many wardrobes of similar design. Originally this piece of furniture was hauled into the room through the window after removing the sash.

After careful measurement, it was found that the wardrobe could be manœuvred into the other room if the base were removed. The question was how to do this without disfiguring a good piece of furniture.

Choosing the Cut.—An examination of the constructional details of the wardrobe revealed that the two panels at the sides of the door were attached to the top of the drawer-top or board by means of glued blocks as indicated by the dotted lines in Fig. 2, while the sides as well as the back (of the tongued and grooved boards) extended from the top down to the bottom. A narrow ornamental bead B surrounded the front and sides, the top of which was level with the top of the drawer board.

It was decided to saw through the sides and back and to remove the glued blocks, which secured the front panels.

First the door was removed. This meant the removal of two metal pegs for hinging purposes, fixed to top and bottom edges of the door by screws. Then a length of $1\frac{1}{2} \times \frac{3}{4}$ in. batten was fastened temporarily across the front to keep it square after the removal of the glue blocks. Careful use of hammer and chisel removed the blocks.

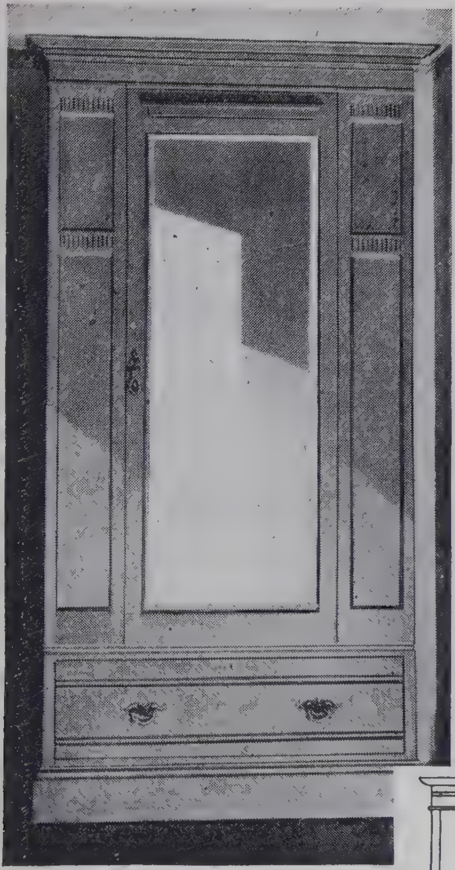


Fig. 1

The top edge of the beading was used as a guide for marking guide-lines for sawing, and removed later by prising it up with a chisel and withdrawing the panel pins.

Then came the task of severing the top from the bottom. This was done by placing the wardrobe on one side and packing it up with flat pieces of wood to keep it a few inches above the floor. The two sides were sawn through very carefully and then the back, pieces of wood packing being placed in suitable positions to prevent the sawed slot from binding the saw.

Having sawn the wood perfectly square, the wardrobe was then carried through the doorway.

Refixing the Top.—The next thing was to reinstate the top portion on the base. This was done with lengths of 1½ × 1 in. planed batten. Having placed the top part of the wardrobe in the exact position on the base, the battens were screwed, wide faces downwards, to the top board of the lower part, and screws driven in through the sides and back into the narrow faces of the battens, while a screw driven through each front panel into the short battens behind them fixed these parts securely.

The beading was then refixed about ⅛ in. higher than its original position to hide the joint made by the saw. The final operation consisted of fixing the door once more in position.

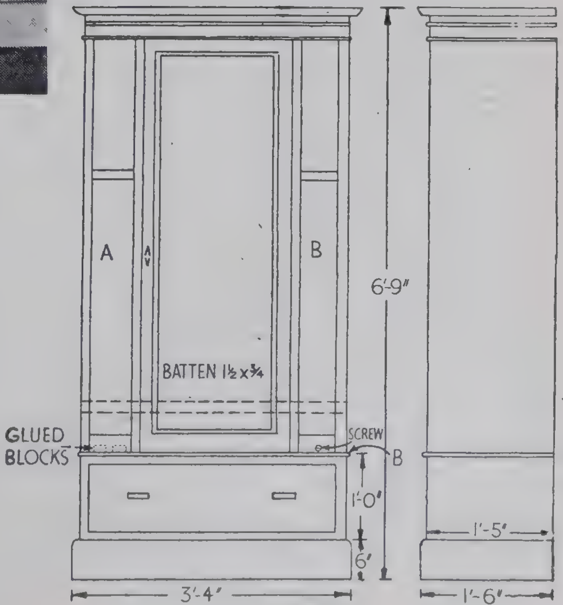


Fig. 2

BROOM RACK

NOTHING ruins a broom more quickly than allowing it to rest, when not in use, business end down on the floor. The life of a broom will therefore be greatly lengthened by making the broom shelf depicted in Fig. 1.

The one shown, details of which appear in Fig. 2, consists of a length of board 5 in. wide and ⅝ in. thick fixed to a back board of the same width and thickness and measures 3 ft. 6 in. long for accommodating three brooms of normal size.

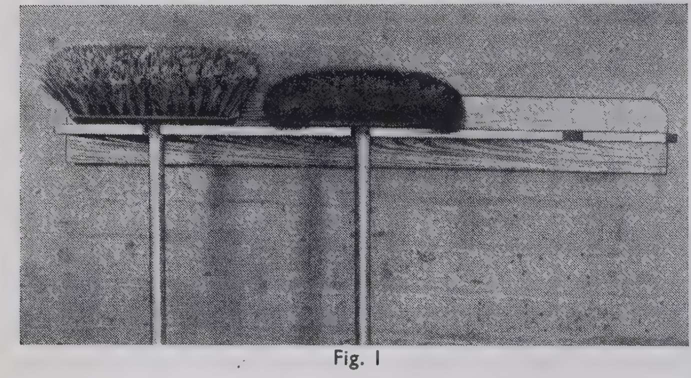


Fig. 1

To make the fitment, procure a piece of prepared board 11 in. wide × ¾ in. thick (⅝ in. finished) × 3 ft. 6 in. long, mark a line down the centre of the wide face and rip the wood down with a saw. Plane the narrow faces and run the plane along the edges to remove the arris, as the sharp edges are termed. Saw off the corners and trim them with a sharp chisel to give the holder a neat appearance.

Cutting Slots.—Now set out the position of the slots. Along the wide face of one of the pieces scribe a line 2½ in. from the front edge, and along this mark the centre of the slots. With a try square and pencil, mark the lines ⅝ in. on each side of the centre lines to meet the first scribed line, and then trace curves at the back.

Place the board, front edge uppermost, in the bench vice and with a pad saw carefully saw out the slots and remove the roughness with medium glass-paper.

Now draw a centre line along the back of the back board and drill five screw holes, one 1½ in. from each end and the remainder at equal distances apart. In addition, bore two screw holes as indicated at A for taking the fixing screws.

Assemble the two members together with screws driven in from the back, and further strengthen the holder by fitting three 2 in. iron brackets to the underside of the shelf and the back board. Fix one of the brackets in the centre and the other two about 2 in. from the ends. Plain iron brackets can be obtained at most cheap stores for about a penny each.

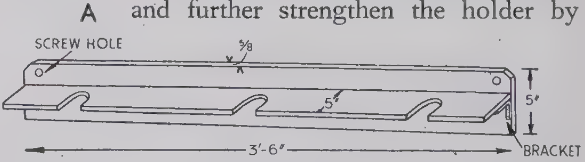


Fig. 2

Stain and varnish or paint, according to taste.

HOW TO CONSTRUCT AN IRONING BOARD AND SLEEVE BOARD

EVERY kitchen should be equipped with an ironing board and sleeve board. They are labour saving and much more easy to work with than the kitchen-table top.

The Ironing Board in Fig. 1 must project beyond the table when pressing trousers, etc., and naturally must be supported at the other end by placing it on the rail of a chair, a convenient ledge or another small table, but for most ordinary ironing it can be placed upon the table.

To make the ironing board, square up a piece of American whitewood, size 3 ft. 6 in. or 4 ft. long, 15 in. wide and 1 in. thick. Draw a centre line down it, parallel to the grain, and mark off the taper at one end $9\frac{3}{4}$ in. wide, as shown.

Saw off the surplus wood and smooth the edges, using a jack plane for the purpose.

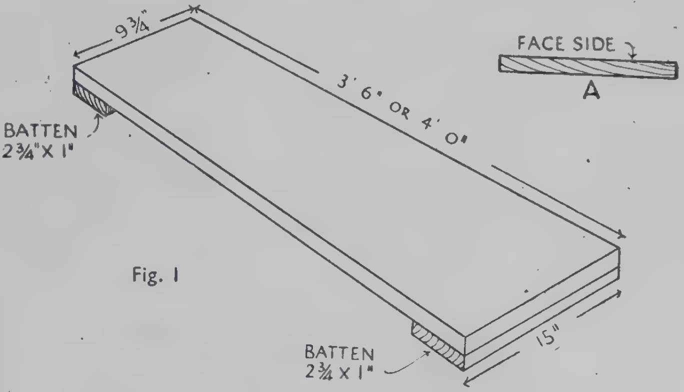


Fig. 1

Saw and square up two battens, one $15 \times 2\frac{3}{4} \times 1$ in. and the other $9\frac{3}{4} \times 2\frac{3}{4} \times 1$ in. Bore a number of holes in the wide faces of these to clear $1\frac{3}{4}$ in. No. 8 brass countersunk-headed screws, and countersink the tops of the holes.

Before fixing the battens to the board, make sure that the heart side of the latter is uppermost to prevent warping. To ascertain the heart side, glance at the end grain and observe which way the curves of the annular rings which surround the heart of the tree run. The face side of the board is the one opposite the concave curves of the rings, as indicated at A in Fig. 1.

Fix the top board to the battens by driving in screws from the underside.

Slightly round the four sharp corners and the top edges with a rasp, plane and glass-paper.

Cover it with a piece of old blanket or similar material in the following way. Put the blanket on the table and place the board on it, upside down. Then, with a pair of scissors, cut out the material about 1 in. larger all round. Turn the board over and place the covering on the top. Press in a number of drawing-pins to keep the material in position, making sure that it is quite smooth. Turn the edges of the material over the edges of the board and secure them by driving in galvanised tacks, spaced about 3 in. apart. Remove the drawing-pins and in a similar way cover the blanket with an old sheet. Finish the board by tacking linen tape all round the edges.

A Self-contained Folding Ironing Board, Fig. 2, can be made with the aid of the dimensioned drawings illustrated in Fig. 3. All woodwork may be of good quality yellow deal.

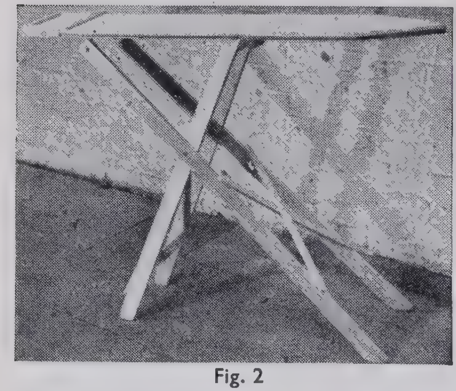


Fig. 2

The top board measures 3 ft. 8 in. long, 8 in. wide and $\frac{3}{4}$ in. thick. One end is sawn to form a point, while the other is fitted with a shallow tray, the bottom of which is faced with asbestos upon which to stand an iron.

The legs are made from planed batten $1\frac{3}{4}$ in. wide × $\frac{5}{8}$ in. thick and each pair of legs is wider at the bottom than at the top, being held in position by wood cross-braces $\frac{7}{8}$ in. wide × $1\frac{1}{2}$ in. thick. The pair of legs marked A in Fig. 3 is held in position to the top board by means of a piece of $\frac{1}{2} \times \frac{3}{16}$ in. iron bent to shape, as shown, while the top of the legs B rest against a stop consisting of a piece of batten $1\frac{1}{4}$ in. wide × $\frac{3}{4}$ in. thick, screwed to the underside of the top member.

The top should be covered with flannel or an old blanket and finished in the manner already described for the plain ironing board.

The Sleeve Board, Fig. 4, has the advantage of standing firmly on the table. It may be cramped to the edge of the table if desired. The top is raised $5\frac{1}{2}$ in. above the base, thus enabling those parts of the garment not actually being ironed to keep out of the way of the worker.

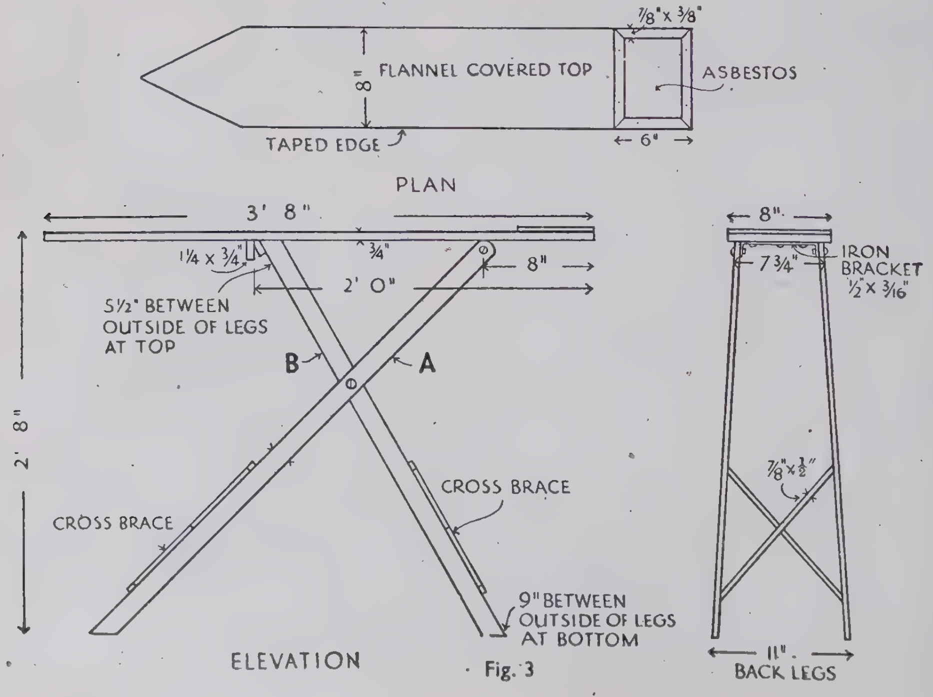

7/8" x 3/8"
FLANNEL COVERED TOP
8"
ASBESTOS
TAPED EDGE
6"
PLAN
3' 8"
1¼ x ¾"
¾"
8"
2' 0"
5½" BETWEEN OUTSIDE OF LEGS AT TOP
B
A
2' 8"
CROSS BRACE
CROSS BRACE
9" BETWEEN OUTSIDE OF LEGS AT BOTTOM
ELEVATION
8"
7¾"
IRON BRACKET ½" x 3/16"
7/8" x ½"
11"
BACK LEGS

Fig. 3

To make the sleeve board, a dimensioned drawing of which appears in Fig. 5, saw and plane and square up a piece of good quality deal, 2 ft. 3 in. long, 7 in. wide × ¾ in. lhick for the top and another piece 2 ft. long × 7 × ¾ in. for the base. Also two pieces 6 × 7 × ¾ in. and 7 × 3½ × ¾ in. for the upright supports, A and B respectively.

Start work on the base. With a pencil and try square scribe across the face a line 1 in. from the left-hand edge and another line ¾ in. from the first one. These lines give the width of the groove. Set the marking gauge to ¼ in. and from the face side (top) scribe a line on each edge to indicate the depth of the groove. Cut down to depth inside the waste between the guide lines and finish the slot with a sharp chisel. Next mark and prepare the mortice to take the lower end of B. The hole should be made 2 in. long and ¾ in. wide. Remove as much waste as possible with a twist-bit and finish the mortice with a chisel. Slightly round the corners at the right-hand end. This completes the base.

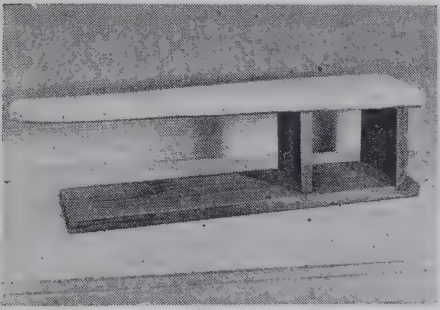


Fig. 4

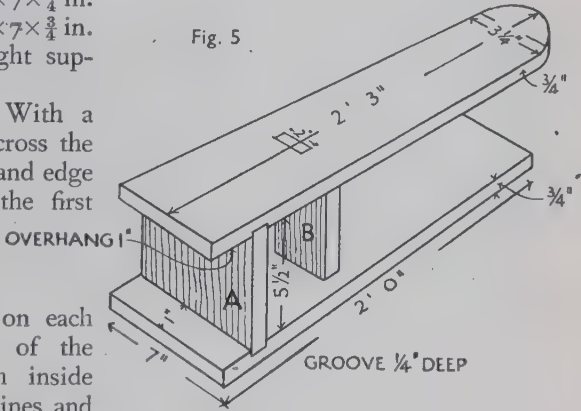


Fig. 5

Now take the top member and mark out the positions of the groove and mortice in the same manner as described above.

Cut the groove and the mortice and then mark the taper on the top face. Saw and plane down to the marked lines, not forgetting to round the narrow end as shown.

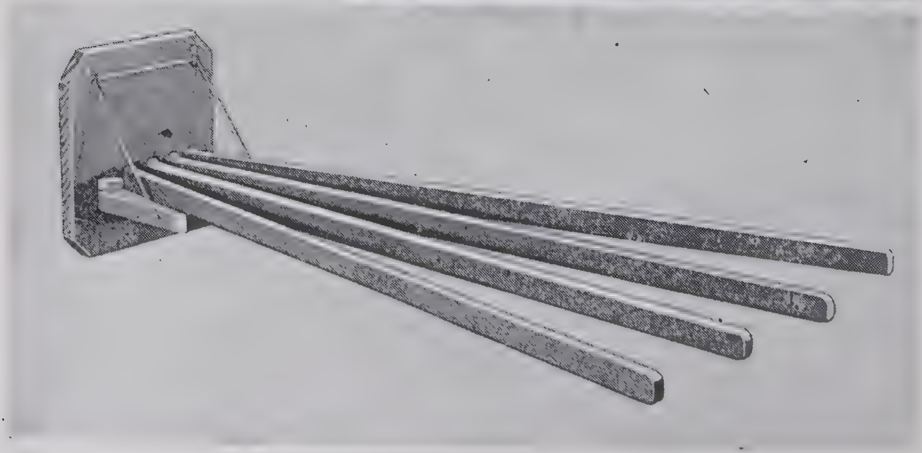
Mark out and cut the tenons on both ends of the support B. Assemble the parts to verify that they are a good fit. If satisfactory, glue the parts together and reinforce the back support A with 1¼ in. No. 8 countersunk-headed screws. Cover the top as already described.

SHAVING MIRROR

An easily constructed and efficient bathroom accessory with a shelf and recess attached to hold brushes, shaving tackle, and any other toilet accessories, etc. Working diagram and construction on page 136.

COLLAPSIBLE TOWEL RAIL

An ingenious space-saving device described on page 137. The spars fold back when not in use.



BUILDING CONSTRUCTIONS AND PROCESSES

PRACTICAL NOTES ON BUILDING A HOUSE

As comparatively few people are in a position to pay cash down for a house, the all-important problem of ways and means must be solved. This is not a very difficult matter. Funds can be raised by borrowing the majority of the necessary capital from a building society and repaying the principal plus interest by monthly or other instalments.

In a great many cases the society would probably advance an amount up to 75 per cent. to 80 per cent. of the valuation of the house. Thus, a responsible person who wished to build a house—say, costing £1,000—would, in the majority of cases, be able to obtain a loan of £750 to £800, the balance of £200 to £250 representing the purchaser's deposit.

Most societies allow a purchaser to repay the loan over any period up to fifteen years or even twenty years, and this does not prevent him from selling the house in the interim if he so desires; moreover, the new purchaser may take over the mortgage by arrangement with the society.

Loans from Local Councils.—Another satisfactory method of raising money to build a small house, is to approach the local Council or the County Council who have powers to make advances under the Small Dwellings Acquisition Act. This excellent piece of legislation was introduced and passed in Parliament some years ago with the object of assisting those individuals to purchase their houses by easy instalments at a low rate of interest, which at the present time is 3½ per cent. Under this scheme, advances up to 80 per cent. of the value of the property as estimated by the Council's surveyor can generally be obtained by approved persons provided the property is within the area controlled by the Council advancing the money. The total cost of such a house must not exceed £800. Repayment is made by monthly instalments, as in the case of most building societies. One of the conditions under which advances are made under the Act, is that the would-be purchaser must himself reside in the house within a period of six months of making the purchase for three years, after which time he is allowed to sell it if he so wishes. This condition, however, is not always enforced.

The purchaser can reduce his mortgage in sums of £10 or multiples of £10 at the expiration of every six months dating from the time of purchase. The amount paid off can be allotted to reducing either the amount of the monthly instalments or the period of the loan.

Insurance Companies. — A good many insurance companies advance money on favourable terms for house purchase; a popular scheme being a loan in conjunction with an endowment life assurance. This plan is sometimes a blessing in disguise as it has the great advantage that should a purchaser die at any time before the mortgage is repaid, the property immediately becomes mortgage-free, even if only one instalment has been paid, by virtue of the insurance policy, which of course remains in the possession of the society. Before a loan of this description is granted, the applicant is required to undergo a medical examination.

Choosing the Site.—In choosing a site on which a house is to be built, make a point of securing, if possible, one with a top surface of loam and a gravel sub-soil. Such a soil is ideal since the top layer is excellent for vegetation and gravel forms a firm and dry foundation, from which moisture can freely drain away.

Although not always possible, a clay soil should be avoided as it both shrinks and expands and is liable to produce settlements in the building, causing cracks which may or may not be serious.

Another very important point sometimes overlooked is to find out whether there are any restrictions as to the cost of other dwelling houses that might ultimately be erected on the chosen site. Unless some such restriction is imposed, it is quite within the rights of other purchasers (in some districts) to erect a residence of obsolete tram cars, or make it into a dump for disused cars.

Road Charges. — Enquiry should also be made as to the probable cost of road charges if the road has not already been made up and taken over by the authorities. This may be a costly affair, especially if the house occupies a corner site.

Choosing a Builder.—Perhaps the most difficult task of all is selecting a builder to carry out the proposed work. It does not necessarily follow that the larger the firm the better the work. Builders in a small way of business often give better value than some firms employing dozens of tradesmen. In any case it is wise to get estimates and specifications from several house constructors of good repute who will, in most cases, also submit designs based on the purchaser's requirements. Estimates and specifications can then be compared, but the contract should not be signed until the specifications and estimates have been scrutinised by some capable person having an expert knowledge of building construction, unless of course you are competent to judge for yourself.

As a guide a typical specification of a small well-built two-floored house, together with a few notes of interest on the subject, will be found in the following paragraphs.

Specification of Proposed House at——————

For——————

Preliminary Items—

Maintenance.—The contractor shall keep the work in repair for a period of six months after the date of the certificate of completion, and any damage, defects or imperfections of any description that may arise during that period, owing to carelessness, defective workmanship or materials shall be made good at the contractor's expense.

Protection of Work. — The contractor from the time of the order being placed in possession of the works, will be held responsible for all damage that may occur by or in consequence of the carrying out of the works to any person or thing whatsoever and will be required to make good, compensate as the case may demand.

Acts.—The work to be carried out in conformity with the Local Acts and By-laws and to the satisfaction of all interested local authorities.

Notices.—Give notices to the local

authorities, gas, water and electricity supply companies. Obtain all consents, licenses and pay all fees and charges in connection therewith.

Plant. — Provide all scaffolding, planking, strutting, plant, tools, and all other things necessary for the complete execution of the works. Remove all surplus plant and materials as and when necessary.

Water.—Provide an adequate supply of water for the purpose of the work. (Town supply.)

Materials and Workmanship. — The materials, workmanship and articles shall be of the best quality and execution.

Protect Work.—Protect work in progress from injury due to sun, frost or drying winds until properly set. Also sub-contractor's work. No mortar or concrete to be used when the temperature is below 39 deg. F.

Clear Away.—Clear away all old materials, dirt rubbish, and superfluous matter and materials as they accumulate, from the whole plot.

Leave Clean.—Twice scrub floors and clean all paving, steps and stairs. Clean windows inside and out and leave the whole of the premises clean and perfect at completion.

Excavator.—Excavate to the foundations of house down to virgin soil. To be inspected and approved by the local building authorities.

Clear all vegetable matter from the whole area of the site and cover same with hardcore ready to receive concrete.

NOTES.—The builder is not allowed to proceed with laying the concrete foundation until the trenches have been examined and approved by the local building authorities. Another inspection and approval is needed after the concrete foundation has been completed and a further examination after the damp-course has been laid.

Concretor. — Concrete to foundations 9 in. of reinforced concrete consisting of clean shingle, approved brand of cement properly mixed and turned, three times dry and twice wet. Mixed to the proportions of three of shingle and one of cement, with one of sand. A suitable number of steel bars with overlapping joints to be incorporated.

Concrete the whole of the site 4 in. thick with concrete mixed in the same manner and in the same proportion.

NOTES.—The quality and proper mixing of concrete is of the utmost importance. Improper mixing greatly reduces the strength of concrete however good the ingredients used in its composition may be.

Steel bars reinforce the concrete and therefore make a stronger job than plain concrete.

Concreting over the whole site within the area of the foundation prevents damp rising which would be unhealthy. It also protects the woodwork of the ground floor from rot.

Drainer.—Excavate trenches and lay on concrete 4 in. first quality glazed earthenware pipes, to be run to intercepting chamber and connected to sewer by corporation.

All collar joints to be properly made in neat cement and trowelled off round and to be watertight.

Manholes to be at all junctions and excavated for, bricked up and trowelled off round channels in a workmanlike manner.

Render float and set to inside of brickwork.

Fix necessary fresh air inlets.

Grease down cast-iron manhole covers 24×16 in.

Fix all gullies with double gratings where required.

On completion the whole to be tested and approved by the local council and certificate of habitation issued.

NOTES.—Manholes are needed at every junction, and the covers are greased down to prevent the escape of foul air.

The concrete bed under the drain pipes prevent them from being damaged should there be a slight subsidence of soil.

The trenches must not be filled in with soil until the whole system has been tested and approved by the authorities.

Bricklayer.—Bricks to be hard facing bricks of approved quality and to be laid in cement mortar of an approved brand of cement, clean sand free from all salt and dirty nature, to be mixed to the proportions of three of sand and one of cement, mixed in small quantities and to be used straight away and not re-used after once setting.

All exterior walls to have 2 in. cavities and tied with proper galvanised wall ties at approximately every three feet apart, and ever six courses.

Cavities to be kept clear of all mortar droppings.

No brickwork to be carried on in frosty weather.

All sleeper walls to be honeycombed.

Air bricks to be fixed under ground floor and under roof plate at equal distances round the whole of the building. Above the ground floor, walls to be carried up in 4 in. hollow blocks covered with 1 in. rough boarding and tile hung. Tiles nailed on every one, with proper lap.

Chimney pots to be short terra-cotta, neatly bedded on in cement.

Chimney stacks to be carried up in brickwork with double damp-course below and above joint of roof. Sett-offs of chimney stacks to receive tiles, properly bedded on and made watertight.

Lead flashings neatly cut in and properly dressed.

Flues to be parged in cement.

All face work to be pointed in neat cement.

Window heads to receive thick bitumen aprons.

Fireplaces to be approved by owner p.c. sum of an agreed figure.

NOTES.—The quality of cement mortar specified is quite good and the conditions regarding mixing in small quantities and to be used straight away is in order because mortar loses its effectiveness after it has become dry.

Cavity walls seem to be the order of the day and provided they are carefully constructed generally form a dry and warm building.

The ties are made of galvanised iron and are designed so that a portion hangs down in the centre in order to allow any moisture to drip down between the cavity to the bottom of the wall.

An accumulation of mortar droppings in the cavity between the walls would defeat the object of the cavity and in all probability cause dampness—hence the paragraph relating to mortar droppings.

Lead flashings refer to a method of rendering joints, such as those between the chimney stacks and roofs, watertight.

Parging is the term given to the flue linings.

The reference to the fireplaces means that the owner can choose his own fittings up to a prime cost (p.c.) as stated. Should a more expensive fireplace be required the owner would have to pay the difference.

Damp-course.—A damp-course of double slate to be laid in cement under all plates, including main walls and honeycombed sleeper walls.

Internal partition walls to be built in 4 in. and 3 in. partition blocks laid in cement mortar same quality and proportions as already stated.

Steps of front porch to be carried out in 8×8 in. quarry tiles.

Notes.—The damp-course is of the greatest importance, for unless the work and the materials are up to the highest standard the bugbear of dampness will surely arise. A double slated damp-course is accepted by most architects as being the best, although there are some who prefer a high-grade bituminous damp-course interleaved with lead.

Sleeper walls are the low walls which support the joists and flooring on the ground floor. They are honeycombed in order to ensure a good circulation of air, via the air bricks. This is one of the least precautions against what might be termed the house owner's greatest enemy—dry rot.

The blocks used for partition walls refer to hollow blocks specially designed for the purpose and make better walls than those constructed of coke-breeze.

Carpenter and Joiner.—All timber to be of yellow deal of dry, clean and good quality.

Roof to be supported by 4×2 in. common rafters, 9×2 in. hip rafters, 4×3 in. plates, 6×4 in. purlins, 7×1 in. ridge. All to be spiked and properly nailed together to form the roof.

The whole roof to be covered with ½ in. boarding and one-ply felt ruberoid, properly lapped, battened and counter battened with ¾×1 in. battens ready to receive tiles.

Valleys to be double felted to form secret gutter.

Facia board 7×1 in. prepared.

Match boarding to soffit of eaves.

¾ in. elm boarding to gables.

Top ceiling joists to be of 4×2 in. strutted at equal distances.

First floor joists to be of 8×2 in. Herringbone strutting to be equally spaced between the joists.

All ceilings to be ½ in. insulite composition boarding properly nailed to joists and finished with an approved plaster.

The ceilings of hall and dining-room to have 3×2 in. false joists securely nailed to the underside of the composition boarding instead of being plastered, and spaced about 12 in. apart.

3 in. plain cornice to all rooms.

2×1 in. picture rails.

4×1 in. rounded skirtings.

Door linings to be of 1 in. clean deal properly fixed to brickwork with 3×1 in. double half-round architraves with 6×1¼ in. plinth blocks, ½ ovolo moulded stops.

Doors to be plain, 6 ft. 6 in. ×2 ft. 6 in. hung on 4 in. cast-iron butts. Mortice locks and bakelite furniture.

Flooring of first and ground floor to be of Columbian pine tongued and grooved and secret nailed.

All joists round hearths and chimney breasts to be properly trimmed.

Front door to be made in Japanese oak according to pattern and to be hung on 4 in. brass butts to solid oak frame with oak sill, weathered and throated.

All sashes and frames to be 1¾ in. sashes, 3×4 in. frames. Solid rebated and ovolo moulded. 3×6 in. weathered sunk and throated sills.

Every other sash to open.

Wood lintels over all heads to be covered with expanded metal ready for plastering. Lintels to be 1 in. deep for every foot span.

W.C. seats to be in bakelite, double flap in bathroom, single flap ground-floor lavatory.

Double draining boards on each side of sink in kitchen to be made of teak hardwood, grooved and properly bedded on to sink. Cupboards to be formed underneath. Cupboard catches on doors.

A suitable larder to be constructed on one side of draining board and a cupboard on the other side with four tiers of shelves in each. Marble in larder and wood in cupboard.

Sash and frame to larder to be 2 ft. × 18 in. overall, to open inwards and provided with a fly screen.

Cupboard doors and larder door 2 ft. 6 in. × 6 ft. × 1½ in. to match remainder.

Dresser with two glass doors to measure 4 ft. × 3 ft. to be made with three rows of shelving with necessary brass cup hooks, to hang on wall.

Doors glazed with 21 oz. glass.

Stairs to be in deal, 1¾ in. treads and risers. 1½ in. wall and 2 in. outer strings, 4 in. newel posts round or acorn-shaped newel tops with oak panelled balustrade.

Mopstick handrail. Soffit of stairs to be panelled with oak moulding slip.

Garage doors to be of 2 in. clean deal, ledged and braced and hung on 2 ft. 6 in. cup cast-iron hinges.

The walls of the hall to be treated with plastic paint.

Notes.—Common rafters are those which are fixed between the roof ridge or top board and the top plate of the wall. Hip rafters are the lengths of timber which form the angle between the sides of the roof, while purlins are horizontal members that support and strengthen the roof.

The facis board carries the gutter and the soffit is attached to the undersides of the rafters where they project beyond the wall.

Plumber and Ironmonger.—All furniture to be bakelite, either round handles or lever locks of good quality, with keys, striking plates, etc., 3 in. bronze bolts for casement doors, two at each.

One Berlin black letter-box to be let into brickwork.

Berlin black Yale pattern lock, knocker and handle and Berlin black Gothic latch for front door.

Two foot bolts and two chains bolts for garage doors with yale pattern latch.

Two holes to be cut in cement outside for keeping garage doors open.

30 in. iron cup hinges to be fixed to garage doors and gates of required size and strength.

All keys to doors to be handed to owner on completion.

Supply and fix one 35 gal. copper cylinder in linen cupboard.

One 60 gal. cistern of galvanised iron 14 gauge with ball valve and lid to be fitted in roof.

Supply and fix two low pedestal W.C.'s as selected.

Chromium plated wastes of latest pattern to all basins, bath and sink.

Supply 24×18×10 in. white glazed sink, chromium plated taps, waste and chain to be built in between the walls in bathroom.

Wash-hand basin to be fixed in bathroom with suitable brackets.

Run all cold water services in heavy lead pipes with properly wiped joints.

Pipes to be hidden where possible.

Hot water pipes to be run in ½ in. copper tube, 1 in. flow and return to boiler and cylinder ½ in. services.

Cisterns to be tested before being taken over by owner.

Boiler to be of a suitable domestic type.

Tap to be put in garage to be bibcock of brass.

Half-round 4½ in. gutter on brackets to be screwed to fascia.

2½ in. stack pipes, 4 in. L.C.C. iron soil pipes.

All shoes, stop ends outlets, cistern heads as required. Chromium plated hat and coat hooks in all cupboards.

Stop-cock to be fixed in service pipe on entry into house and draw off tap fixed directly over to empty main.

All pipes in roof to be protected against frost.

Notes.—Bakelite, a manufactured product which can be moulded into various shapes, is rapidly taking the place of metal for lock furniture, electric light switch plates, etc. Such fittings are inexpensive, can be obtained in numerous colours and designs and have the advantage of not having to be cleaned.

Chromium-plated metal has the advantage of retaining its lustre and colour.

Deep sinks are the order of the day. Such sinks can only be fully appreciated by those individuals who have experienced working at a shallow one.

Copper Piping for the hot-water system is a modern innovation. Among the many benefits to be derived from their installation is that they are not so unsightly and are not so likely to furr up as heavy gauge iron barrel.

The Half-Built House showing Built-in Garage—Front View

The same—Back View

There are many types of domestic boilers, using many varieties of fuel. An excellent kind is one that is self-regulating—that is, as the water heats up it automatically closes a damper and reduces the draught and therefore the amount of heat and incidentally fuel.

A water tap in the garage is one of those conveniences very often overlooked and should never be omitted.

A draw-off tap to empty the water mains is also another item which should not be forgotten.

Plasterer.—The whole of internal walls to be rendered in cement and set in sirapite. Make good after all trades.

The plastering in kitchen and bathroom, etc., to be specially prepared to receive paint.

Glazed Tiler.—Tile sink and draining boards with 6×6 in. ivory tiles and black edging and birdbeaks.

Floor of cooker and boiler recesses to be rendered in cement.

Bathroom and ground floor cloakroom to be tiled in 4 ft. high with 6×6 in. ivory white tiles, black edging and birdbeaks.

Roof Tiler.—Tile roof with antique-finish best quality British-made tiles, bonnet hips and half round ridge.

Notes.—Roofing tiles form one of the most important items of house construction. Beware of cheap foreign tiles of the semi-glazed variety. They are likely to split and flake at the no distant future. Insist on British tiles—always. They can be depended upon.

Electrician.—One lighting point to include plain pendants without shades and lamps to be installed in all rooms and one power point of 15 amp. capacity in dining-room, lounge, hall, bathroom and each bedroom.

All work to be carried out in strict accordance with the rules and regulations of the Institution of Electrical Engineers and the supply authorities.

All wires to be of best quality 600 megohm grade vulcanised india-rubber and of British make and protected by Simplex close-joint enamelled steel conduit properly bonded and effectively earthed.

All power plugs to be three-pin combination switch-plugs, surface type.

Each power plug to be protected by separate double pole fuses enclosed in a Home Office type fuse board and a similar board of 5 amp. capacity per way to be supplied and fixed to suit the arrangements of the lighting wiring.

One iron-clad double-pole combined main switch-fuse of a capacity to suit the power circuit and a main switch-fuse for lighting circuit fixed near the entry of the supply company's mains.

Notes.—It is of the utmost importance that the electrical installation be carried out in a safe and efficient manner, and executed by competent electricians. This part of the house construction is generally done by sub-contractors, so make sure that the sub-contractor is one of good repute.

Painter and Decorator.—Ground-floor joists to be creosoted immediately after completion. All woodwork to be prepared and stained with Darkaline of an approved shade and varnished throughout the whole of the house. Gutters to be painted inside and out with bitumastic black. Hot-water pipes where showing to be painted in accordance with the decorations of the room in which they appear. Exterior woodwork sashes and frames, eaves, gutter boards and soffits to receive three coats of best quality lead oil paint. All paintwork to be stopped and primed and finished in an approved colour. Kitchen W.C. and bathroom walls to be painted and finished in Silexore.

Walls in all rooms to be distempered or papered with paper 2s. per piece.

Clear 21 oz. glass to all windows except W.C. and bathroom, or any other where obscured glass is required.

Obscured glass to be small ripple or cathedral.

Form ash and brick rubble drive with smooth surface from garage to entrance gates.

Supply and fix stock pattern oak gates, hung on cup hinges of required strength to 6×6 in. oak posts properly cemented in and made tight.

Supply and fix one small 3 ft. gate with post, etc., for tradesmen's entrance with path similar to garage drive.

ERECTING A PARTITION

MANY houses have a bedroom measuring about 20 × 14 ft., running from the front of the house to the back, with a window at each end and a fireplace in the centre of one of the long walls, as indicated in Fig. 1. Such a room is ideal for converting into two small ones, and the cost of making the alteration can be reduced to a minimum by doing it yourself.

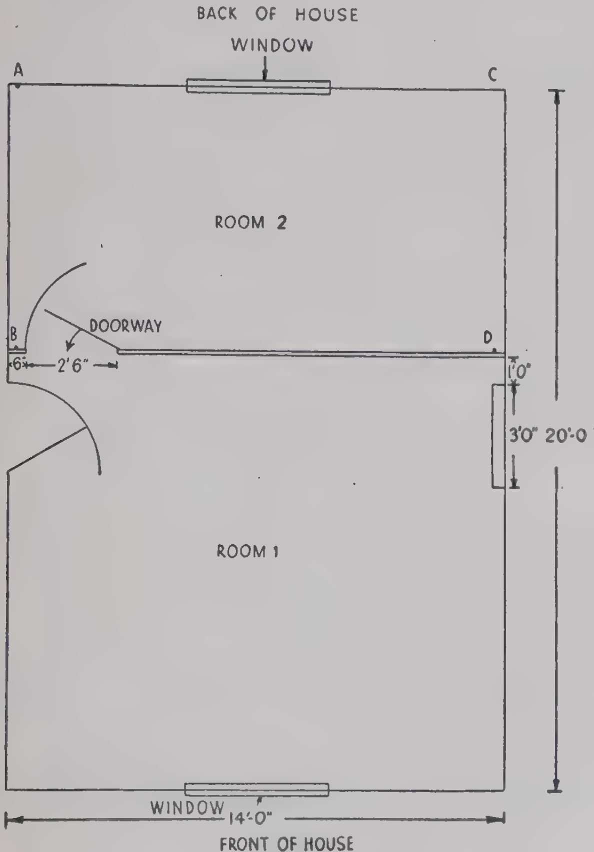


Fig. 1

It is possible to divide such a room into two rooms of equal size, by covering in the fireplace, but this would spoil the appearance of both rooms. It is better to make one room larger than the other and so retain the fireplace in one of them.

It is a matter of taste whether the smaller room shall be at the back of the house or at the front. In either case the partition should not be erected closer to the fireplace than a distance of 1 ft.

The best time for carrying out the work is just before redecorating, as this will enable both sides of the partition to be finished in accordance with the decorative scheme of the rooms. On the other hand, the partition could be painted to match surrounding woodwork.

Important Points.—Before starting work, it is good to consider one or two details. If the floor in the room is covered with linoleum in good condition, there will be no need to take it up. The partition can be built upon it and cut afterwards at the skirting. A carpet should, of course, be taken up.

If possible, arrange the doorway so that it comes near the end opposite the fireplace and not in the centre of the partition. A doorway in the centre of a small room is not conducive to economy of space.

Another point which should be

decided is the material for cladding the framework of the partition. Tongued and grooved V-jointed matching makes for stability and could be used if the new wall is to be painted. But if the partition is to be papered, the matching should have a perfectly flat surface, which can be obtained by using an overlay of plywood $\frac{1}{8}$ in. thick.

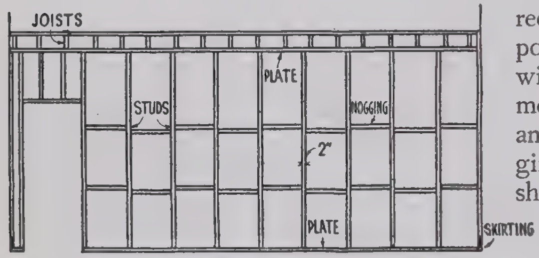


Fig. 2

Another method is to cover the framework with one of the many excellent kinds of building boards. Alterations may be necessary to the lighting. If the house is wired for electricity the work should be done before the framework is covered in as it enables tubes carrying the lighting wires down to a switch to be concealed; the ends of the wires being simply threaded through a hole in the wall-covering during erection, and connected to the switch when complete.

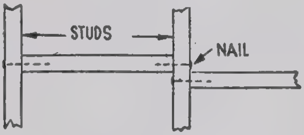


Fig. 3

It is customary to hang the door in the doorway so that it opens towards the bed and closes on to a nib of projection not less than 6 in. wide. If this principle can be followed so much the better.

The framework consists of a top and bottom plate to which a number of vertical studs or posts are secured by nails. The section of the wood (deal) should not be less than 3×2 in. and this is arranged narrow face outwards as illustrated in Fig. 2.

Materials Required.—Assuming the height of the room to be 8 ft. 6 in., the length of the struts will be 8 ft. 2 in. Four such pieces will be required for the ends and the door posts while eight intermediate ones will also be needed. These intermediate studs should be spaced at an equal distance apart. Two nogging pieces as illustrated in Fig. 3 should be fixed between each stud to make the structure rigid. Each of these will measure a little over 1 ft. 9 in. in length. The head of the door will require a further 2 ft. 6 in. length and the short studs above it, two pieces each 1 ft. 8 in. in length.

The top plate is in one piece and extends across the room from one wall to the other. It should, however, measure an inch less than the distance between the walls, to enable it to be manipulated into position without damage to the plaster.

In determining the length of the long and short bottom plates, do not forget that about an inch must be deducted to allow for the skirting board at the ends.

Before marking the position for the top plate, ascertain which way the ceiling joists run in order to obtain a fixing. In a room of this size, it is usual to place the joists across the shortest span, but this is not always the case as the joists may run longitudinally and be supported near the centre by a girder.

Top Plate and Joists.—If the joists are found to run lengthwise, mark out on the ceiling the position of the top plate by first measuring the distance from wall A to B in Fig. 1 and then cutting a piece of batten of that length.

Then mark the position D from the wall at C with the aid of the batten, and also make two intermediate marks measured from each side of the window. Draw a line across the ceiling passing through these marks. If the joists run across the room, and a joist does not happen to come in the desired position, it will be necessary to fix the top plate a few inches towards the back window, so that it can be fixed to the bottom of the joist. A guide line can then be made.

Having cut the plate to length, bore a number of screw holes to clear 4 in. No. 12 screws and fix the plate in position. The latter operation will need a helper to hold the plate firmly against the ceiling while you drive in the screws.

The next operation, that of marking the position for the bottom plates, calls for a string and plumb-bob. Partially drive a nail in one side and near the end of the top plate and from the nail suspend a plumb-bob so that the bottom of the latter just clears the floor. Allow the bob to come to rest and mark the position; then repeat the process at the other end and draw a line joining these two points. Cut the plates to length, bore screw holes and fix the pieces down to the floor, using 3 in. No. 12 screws.

Now mark on all plates the position of the end uprights, door-posts and studs, and cut these parts to length. Each end post will need to be recessed near the ends and on the face in contact with the wall to clear the skirting.

Now fix the whole of the parts together by using 3 in. nails driven in slant wise. Then add the nogging pieces, door head and the short studs above it.

At this stage alterations to the electric light should be carried out.

Wall Fabrics.—When these have been done, the covering material can be added to the framework. Tongued and grooved matching is nailed on vertically with 1 in. cut nails, the heads of which are punched just below the surface after completion. This operation is unnecessary if the boards are to be overlayed with plywood.

The Doorway.—Fit a lining to the doorway. The thickness of the wood for this is 1 in. and equal in width to the thickness of the door-post (3 in.) plus twice the thickness of the covering material, so that the edges of the lining lie flush with the back and front surfaces.

It is a good plan to house the top ends of the members into recesses cut ⅜ in. at the ends of the head piece. The door lining is then fixed.

An architrave consisting of either an ornamental or a plain moulding is then fixed round the edges of the door lining on both sides to cover the joints. The width of this moulding should correspond, if possible, with that of the other doors.

Two short and two long pieces of wooden skirting-board about 1 in. thick and of a width to correspond with the existing skirting will be needed for finishing the partition. These should be fixed with 2 in. cut nails driven into the bottom plate and the studs.

If you have facilities for making a suitable door, and can carry out a piece of accurate joinery, make your own door. The alternative is to buy one. In these days doors can be obtained in quite a considerable number of good designs. A purchased door may have to be cut down and planed, but this is a simple matter.

The door should be hinged with substantial 3 in. cast-iron butts, and a length of door stopping 1½ in. wide × ½ in. thick nailed to the inside faces of the door lining.

FITTING A DOMESTIC STOVE

The old-fashioned kitchener is generally being replaced nowadays by the small, economical self-contained domestic stove, finished with porcelain enamel as the example illustrated in Fig. 1.

Such a stove, whether it be of the open or closed type, shows a saving of anything up to two-thirds of the cost of running compared with an ordinary range. A modern domestic stove can be fitted by any practical man.

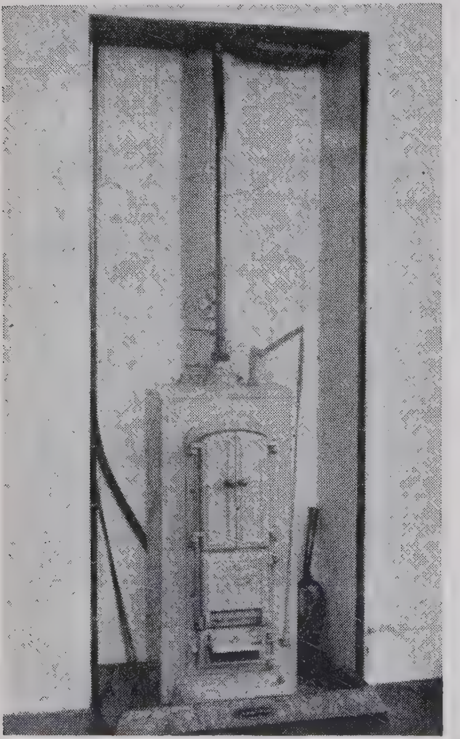


Fig. 1

Readers who are not familiar with the principles on which a domestic hot water system works should study Fig. 2, which shows the usual arrangement of pipes in a small house.

It is hardly necessary to point out that the diameter of the new pieces of pipe must be of the same diameter as the existing ones, and that steam barrel must be used and not the thinner stuff used for conveying gas.

When buying the material, do not forget a loose-handled drain cock for the bottom of the return pipe to drain off the water when occasions arise.

As it is unlikely that you possess tools for cutting the screw-threads on the ends of the pipes, your local hot water fitter or ironmonger from whom you purchase the materials will do this for you for a small additional charge.

The parts should be connected up to the stove to verify that all is correct, after which the pipes should be disconnected and the stove removed to enable walls and floor to be finished.

Installation.—The stove can then be fixed permanently in position and the pipes connected up as before, but this time the joints must be perfectly watertight. To effect this, paint the screw-threads with thick red and white lead paint and wind a few twisted strands of hemp moistened with paint in the channels between the threads, and screw the pipes and fittings up tightly, using a large pair of pipe grips for the purpose.

Now fix the sheet-iron cover-plate and seal the edges with portland cement. Cut the flue pipe to suit, with the aid of a file, allowing a couple of inches to project above the iron to prevent soot falling into the pipe.

Finally, attach the flue pipe sealing ring, generally supplied with the stove, to prevent cold air entering at the joint between the pipe and the sheet iron.

The system can now be tested. Fill the apparatus with water either by operating the stop-cock or by removing the wooden plug in the storage tank outlet, and watch for leaks. If all is well, fill the stove with fuel, get the water hot and look again for leaks. If necessary, tighten up the joints.

To give the pipes a finished appearance, paint them with metallic paint such as aluminium, bronze or other colour to suit the surrounding decorations.

Hot-water Principles.—The cold water storage tank which feeds the hot water system is generally placed in the loft or between the roof and ceilings of the top-floor rooms. This tank is supplied with cold water direct from the main through a ball-operated valve which automatically regulates the height of the water in the tank. From the tank, the cold water flows by gravity via the feed pipe, indicated by the arrow, into the bottom of the hot water cylinder of copper, or a small closed galvanized iron tank. The water then traverses the return pipe and into the boiler where its temperature is raised by the fire. As hot water is lighter than cold, it rises in the flow pipe into the top of the cylinder where it mixes with the cooler water below. Hot water is drawn off from the taps connected to the expansion pipe as shown, one end of which is connected to the top of the cylinder while the other is open-ended and terminates over the storage tank and acts as a safety valve should the water boil in the cylinder.

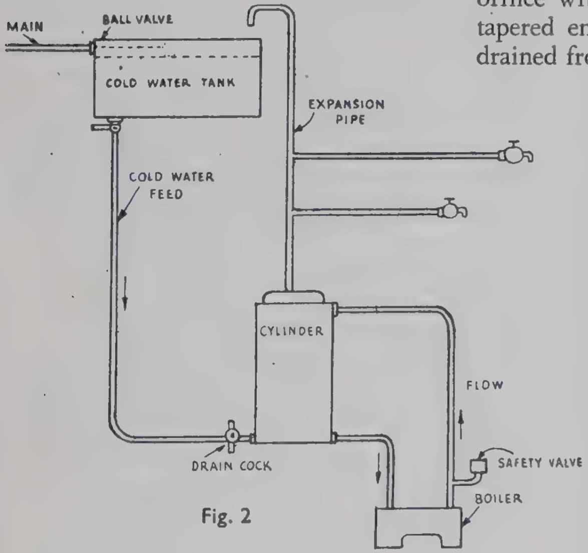


Fig. 2

Drain the System.—The first thing to do when substituting a domestic stove and boiler for a range is to turn off the water supply at the cold water feed cock situated near the storage tank; or, if such a cock is not fitted, to plug the orifice with a piece of wood having a tapered end. The water must then be drained from the system by opening the draw-off cock usually provided for this purpose and turning on the hot water taps.

The range can be taken apart by removing all portable parts such as the oven door and fire bars, and then undoing the nuts, bolts and screws that hold it together. Many of the fastenings will, no doubt, be rusty and difficult to remove, and as there is nothing to be gained by removing each portion intact; the use of a hammer and cold chisel will save a lot of time. Thin cast-iron from which the parts are made is easy to break by this method.

As soon as practicable, remove the boiler by cutting the floor and return pipes at some convenient place just above the boiler and then disconnect the pipes at the first joints which may be a socket as illustrated in Fig. 3. The cutting can be done with a hack saw—or, better still, with a wheel pipe-cutter, the proper tool for the job. This tool might possibly be hired from the local hot water fitter.

The aperture is now clear of encumbrances except for the two down pipes which have to be extended and connected to the new stove.

Walling the Recess.—At this stage consider the method to be adopted for finishing the recess. The walls may be finished in portland cement and sand, or they may be rendered in portland cement mortar and finished with Keene's cement plaster and painted, or they may, if preferred, be fitted with glazed tiles. Tiles are undoubtedly best, but are also expensive. The floor may be either cement or covered with quarry tiles.

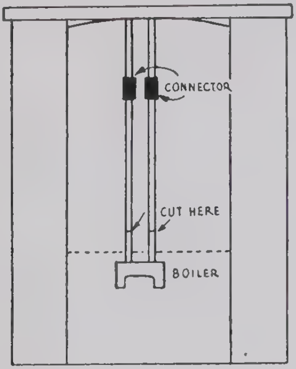


Fig. 3

Having come to a decision about this, measure the roof of the aperture for the cover-plate. The latter consists of a piece of sheet iron about ⅛ in. thick and is held in position by channels cut in the brickwork and supported underneath by two lengths of 1 × ¼ in. irons fixed, one at the front and the other at the back, between the side walls.

Cut the channels about ½ in. deep in the sides and back of the brickwork.

Mark the iron with a pointed tool such as a fine bradawl and carefully cut the metal to size by means of a cold chisel and hammer. Having cut the slots for accommodating the water pipes, fix the cover plate temporarily in position so that the position of the holes for the flue pipe can be marked thereon.

To do this, place the stove in the exact position it is eventually to occupy, and with a plumb-bob and string, plumb the centre of the flue-socket of the stove in the manner indicated in Fig. 4 and mark the corresponding centre point on the cover-plate. Remove the iron and, with a pair of compasses, scribe a circle of the same diameter as that of the flue pipe, then cut the hole with a cold chisel and hammer and finish by using a half-round file.

Estimating Pipe Lengths.—Next, ascertain the lengths of pipe and fittings required for extending the existing flow and return pipes and connecting them up to the boiler.

The amount of pipe and number of fittings such as bends will be determined by the type of stove being installed. Some stoves have the water-pipe sockets at the back, others at the side, while in several makes one socket is placed at the top. In any case, the upper ends of the new pipes must be fitted with running threads as illustrated at A in Fig. 4 to enable them to be connected up to the old ones.

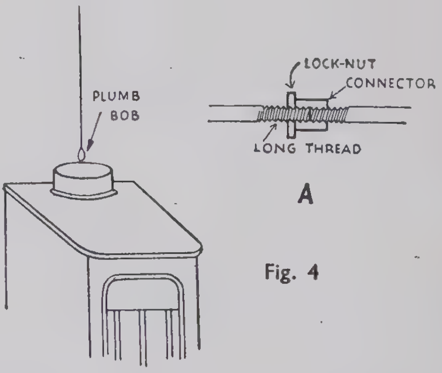


Fig. 4

PANELLING A ROOM IN PLYWOOD

PANELLING walls in wood is undoubtedly not only the most charming way of dealing with walls but also preserves them and saves the expense and labour of constantly re-painting, papering or distempering.

The sketch, Fig. 1, shows a room panelled in oak-faced plywood.

A Scale Drawing.—Details of the panelling are shown in Fig. 2. Before beginning work on a room, draw the dado lines 1½ in. apart all round the room at a height of 3 ft. 4 in. from the top line A. Make a scale drawing of the setting out of the panels and skirting below the dado lines as it is better to make this part of the panelling first (and, if desired, leave it panelled to the dado rails only).

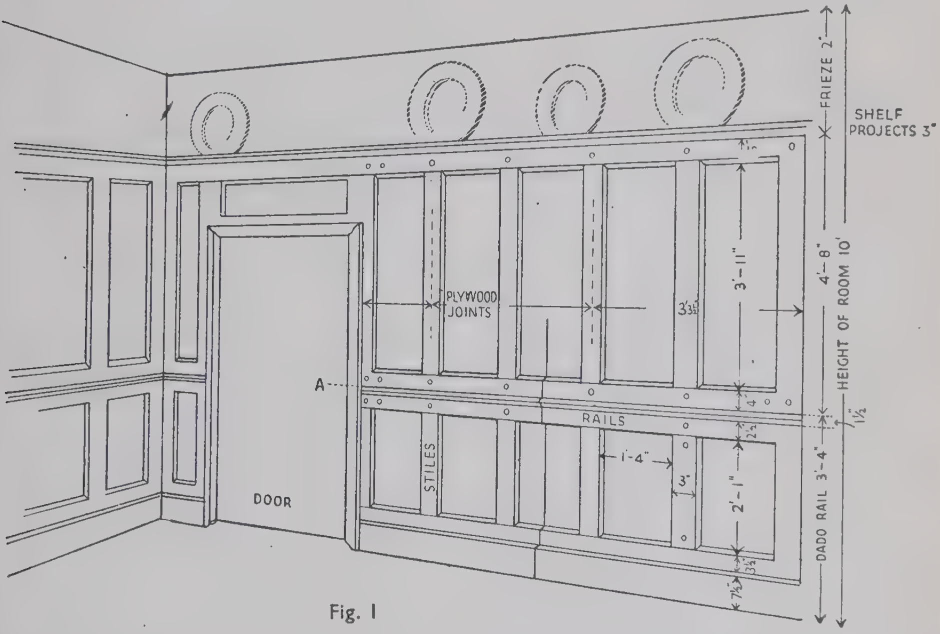


Fig. 1

Consider carefully each plain stretch of wall and on the scale drawing, set out the stiles and rails so as to bring the size of the panels as near to 2 ft. 1 in.× 1 ft. 4 in. as possible.

Take off the old skirting and plane and bevel some lengths of oak skirting, size 7½× ⅞ in.

Begin by fixing this to the longest wall—in the clear (against the end walls). Screw this on this way: on the face of the skirting, bore holes ⅜ in. diameter and ¼ in. deep only (this is for countersinking and plugging with oak pegs). Then at the bottoms of these bore through with a $\frac{5}{16}$ in. twist-drill.

Now wedge the piece of skirting in place and with the $\frac{5}{16}$ in. drill bore just through so as to mark the positions of the holes on the wall. Take away the skirting and with the same $\frac{5}{16}$ in. twist-drill bore holes in the wall 1 in. deep.

Make some soft wood plugs, round

them carefully to a tight fit, hammer them in and saw off level with the wall.

Put the skirting again in place and screw up.

Make some 13 in. lengths of oak dowels $\frac{5}{16}$ in. diameter, glue and hammer them in, carefully saw them off and file level. These pegs hide the screws.

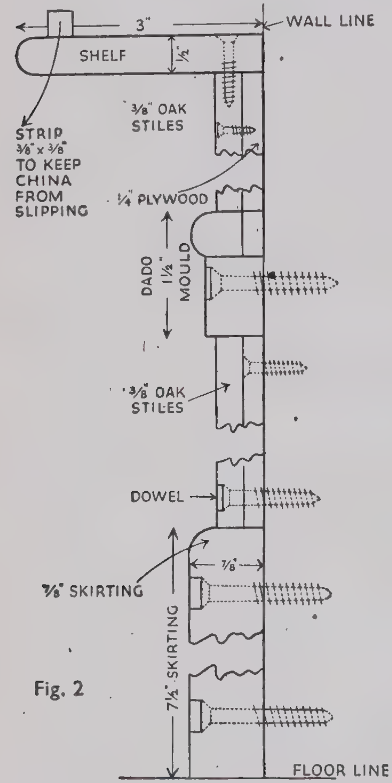


Fig. 2

Finish this skirting all round the room first, then plane up sufficient strips of oak—some $3\frac{1}{2}$ in. wide and some $2\frac{1}{2}$ in. wide—all these pieces are $\frac{3}{8}$ in. thick only.

Now plane and mould the necessary lengths of dado moulding and fix this all round the room as before described and plug up the screw-heads. Next, mark the position of the rails (horizontal) and stiles (vertical) on the wall.

Fixing the Plywood.—Everything is ready now for fixing the oak-faced $\frac{1}{4}$ in. plywood. This is fitted close up under the dado moulding and on to the skirting.

Cut the plywood up (the grain must be the long way of the panels) so that the joins come behind the stiles as shown, and all screws that fix the plywood to the wall must be countersunk flush with the face of it, in positions behind the rails and stiles. Then screw up the plywood.

Saw off the two end stiles, size 2 ft. 7 in. $\times 3 \times \frac{3}{8}$ in. fix them tightly in the clear. Then bore them as described and screw them right through into the wall as shown, and plug up.

Now screw on the top and bottom rails in the same way and finally the 2 ft. 1 in. $\times 3 \times \frac{3}{8}$ in. stiles.

This completes one length of panelling below the dado moulding.

Work round the room in the same way, and then proceed with the panelling above the dado. First carefully measure down from the ceiling 2 ft., draw the line all round for the frieze then draw another line $\frac{1}{2}$ in. above the first line (the $\frac{1}{2}$ in. is taken out of the frieze which is actually 1 ft. $11\frac{1}{2}$ in.).

Now fix and screw the two end stiles as before, then the top and bottom rails. Fix the plywood on the walls and finally the shorter stiles.

Cut out the required lengths of shelf $3 \times \frac{1}{2}$ in. thick, then tack on a strip of wood $\frac{3}{8} \times \frac{3}{8}$ in., about $\frac{1}{2}$ in. from the front of the shelf, clean up the shelf and pin the strip on with 1 in. panel pins. Before fixing this, hammer in the pins so that their points almost come through the underside of the shelf.

The panelling shown is for a room, size 15 ft. × 10 ft. 2 in. × 10 ft. high. The measurements may be increased or modified in the case of a larger or smaller room.

The general practice is to take one-third of the total height for the dado rail, and measuring down from the ceiling, take a little less than one-third of the wall space left, this determines the width of the frieze. Regarding the panels: do not make them much larger (to save work) or they will be out of proportion to the size of a room as shown in the illustration.

Large panels make a small room look smaller still.

It is not advisable to use birch plywood; this wood does not take stain well.

Woods and Finishes.—As an alternative to oak-faced plywood, Columbian pine might prove cheaper. It has a beautiful grain and looks well if only wax polished. French polish or linseed oil turn it yellow.

For finishing the oak-faced plywood two methods are suggested.

1. Leave it a natural colour.
2. Polish with turpentine and wax only.

Should a darker effect be required, stain it with vandyke brown powder and .880 liquid ammonia (mixed 50-50) and thinned out with water to the required colour. Then polish with beeswax and turpentine.

IMPROVING A SMALL HOUSE

The following paragraphs contain descriptions of alterations carried out in a small pre-war terrace house, in order to modernise it. The article has been written for readers who may have similar homes and wish to make improvements. The alterations were made at such odd times as were at the disposal of the owner, covering a period of several years and show what can be done by a man of ordinary intelligence who can use tools.

Forethought is desirable when planning the season and time in which to undertake alterations. Some improvements may take a considerable period of time to complete, especially by a man unable to devote the whole of his time to them. Half-completed jobs make a house untidy and unsightly.

Fig. 1 represents a rough plan of the ground floor before the alterations and additions were put in hand. The ground floor apartments consist of a small hall with the usual staircase, a sitting-room, kitchen, scullery, and an outside lavatory and coal cellar. The upper floor contains three bedrooms as indicated in Fig. 2.

Installing Electricity.—The first thing tackled was the installing of electric light and power, taking down all the gas fittings and sealing off the ends of the pipes, special care being taken to see that all such joints at the gas plugs were absolutely gas tight, thick red lead paint being painted on the gas threads for this purpose. Then followed the actual installing of the electric light, which was carried out in the close-joint conduit with continuity fittings, such as elbows, tee-pieces and junction boxes so that it could be efficiently earthed; a very important item rightly insisted upon by the supply authorities.

While this was being done the supply company laid the necessary service cable. A position for the meters, under the stairs, was mutually agreed upon and as the distance from this point to the front boundary hedge measures 30 ft., a charge was made which it was subsequently discovered compared well with the usual charge in most districts.

As there was no means of gaining access to the space between the roof and the first-floor ceilings to allow tubes to be fixed on the top of the joints, a trap door had to be made for this purpose and the joists cut and trimmed to take it, otherwise it would have meant running unsightly tubes on the faces of the ceilings below.

As some of the walls between the rooms on the upper floor were lath and plaster partitions, no difficulty was experienced in concealing the tubes where they ran down to the switches. A hole was bored in the wall-plates at the top which allowed the tubes to be inserted in the hollow space within. In one wall only did a channel have to be cut to bury the tube. Tubing and wiring the ground floor presented no difficulty as the floor boards under which they were run were quite easy to take up. Most of the walls on the ground floor were brick. As it meant much cutting away to bury the switch tubes, and the decorations of some of the rooms were in good order, it was decided to group the switches and place them in the lobby. Incidently this method of grouping saved a considerable amount of conduit and wire and should therefore be noted. The position of the switches is indicated by a letter S; in Fig. 1.

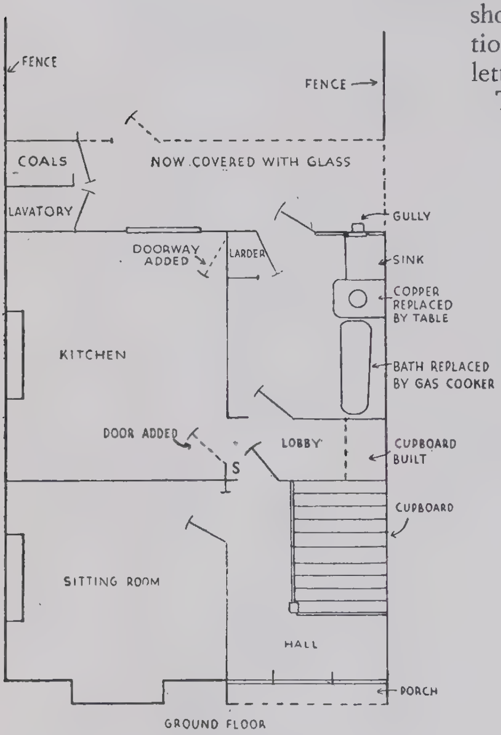

FENCE
FENCE
COALS
NOW COVERED WITH GLASS
LAVATORY
GULLY
DOORWAY ADDED
LARDER
SINK
COPPER REPLACED BY TABLE
KITCHEN
BATH REPLACED BY GAS COOKER
DOOR ADDED
LOBBY
S
CUPBOARD BUILT
CUPBOARD
SITTING ROOM
HALL
PORCH
GROUND FLOOR

Fig. 1

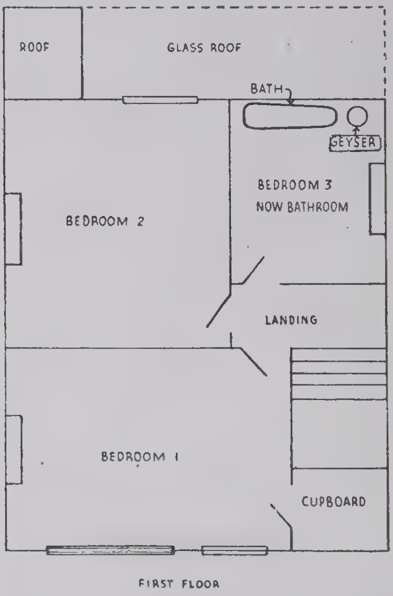

ROOF
GLASS ROOF
BATH
GEYSER
BEDROOM 3
NOW BATHROOM
BEDROOM 2
LANDING
BEDROOM 1
CUPBOARD
FIRST FLOOR

Fig. 2

The hall light, a lamp which could be turned down at the pull of a cord, was operated from the lobby and the first floor landing, while the two large bedrooms were fitted with plugs for bed-lights. A power plug was installed in every room.

Kitchen to Living-room. — The next item was the conversion of the kitchen into a living-room. This apartment contained an old-fashioned kitchen

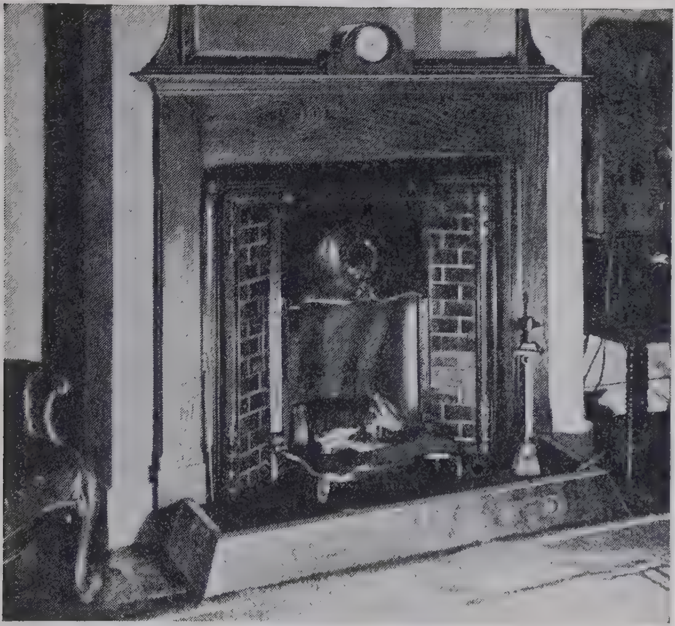


Fig. 3

stove. A low open grate was fitted in its place and a suitable oak surround constructed, as shown in Fig. 3. Through an oversight of the builder, no door had been provided between the kitchen and the small adjacent lobby. To isolate the latter, which was useless from a practical point of view, a door was made and fitted as indicated in Fig. 1, and the lobby was made serviceable by constructing a cupboard from floor to ceiling.

The larder door opened into the scullery and this meant that food had to be brought through the scullery into the living-room. A doorway was cut in the wall and a door fitted at the back of the larder so that access could be obtained from the sitting-room. The door on the scullery side was retained, (See Fig. 4.) After these improvements had been carried out, a picture rail was added, the walls and ceiling re-decorated and the woodwork repainted.

The Scullery.—contained a projecting brick copper and a bath as shown in Fig. 1 which took up valuable space. The brickwork of the copper developed an unsightly crack and the copper itself showed signs of decay, while the bath, an old painted affair, badly needed a few fresh coats.

A few hours work with hammer and cold chisel demolished the copper and the flue was effectively blocked with a few of the old bricks and portland cement and sand mortar. The plaster was made good with Keene's cement. The bath was retained for a time until

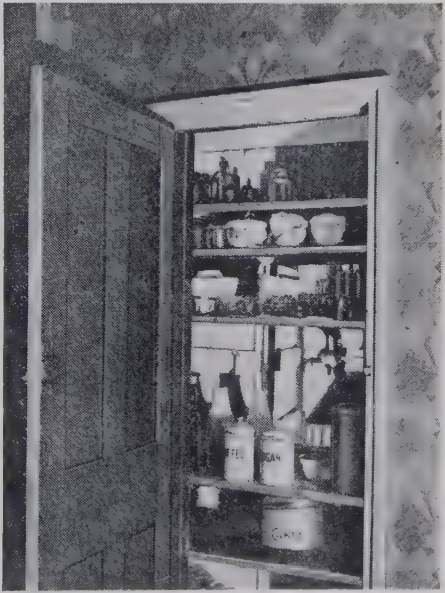


Fig. 4

a new porcelain one had been installed in the small unused bedroom which was converted into a bathroom. In place of the old copper, a modern gas copper was obtained, which, when not in use, was housed under a flap table attached to the wall, and the space formally occupied by the bath was partly filled by an up-to-date gas cooker.

The New Bathroom.—In the bedroom which was made into a bathroom, the bath was placed under the window and the waste pipe carried down an outside wall to discharge in a gulley below. Cold water was obtained from a pipe connected to the main supplying the sink immediately below.

To overcome the difficulty of obtaining hot water for the bath, a semi-rotary pump was installed in the scullery. This scheme eliminated the weary process of carting bucketsful of water up the staircase. The pump gave satisfactory service for some years when it was replaced by a gas geyser.

Improvement in the hall was effected by enclosing the space under the stairs. This space was made into a cupboard for overcoats, hats and other outside wearing apparel.

An electric bell was fitted at the side of the front door to ring in the lobby. This replaced a mechanical bell which required constant winding up.

With regard to the original sitting-room, except for the addition of a picture rail, re-painting and re-decorating and fitting bookshelves, nothing else was done to it. Little was done to the bedrooms except the usual re-decoration.

The Back of the House.—The last job so far as the house was concerned was to concrete the area between the lavatory and coal cellar and the right-hand fence, and then cover it in with a glass roof, part glass front with a garden door, and matchboarded side.

This proved equivalent to an extra room for it contained a large table upon which electric ironing and other various odd jobs, including carpentry, could be carried out in a good light.

The size of the glass lean-to was 12 ft. 6 in. long × 6 ft. 6 in. wide. The surface soil was removed to a depth of 12 in. to enable the finished surface of the concrete to come just below the level of the air-bricks. The excavated site was then carefully levelled and filled with small brick rubble to a depth of 5 in., rammed down tightly and levelled to form a solid base. On the top of this was added concrete made up of one part portland cement, two parts sand and four parts aggregate, consisting of small washed stones. To give a durable smooth surface, an inch top layer of cement mortar consisting of one part cement and three parts sand was applied. When the floor had been allowed to harden a course of bricks placed longways, technically termed stretchers, was laid along the front edge, except a gap to be occupied by the doorway, and along one side. The bricks were then given a coat of cement on both sides and along the top and upon this was placed a damp-course consisting of specially prepared bitumen felt sold for the purpose. The damp-course prevented moisture rising to the sill or bottom plates of the structure and preserved the wood from rot.

The height to the eave was 6 ft. 8 in. from the floor level and the height at the back 10 ft. 10 in. The slope of the roof thus formed corresponded with the roof covering the lavatory and coal cellar and allowed the rain water to get away quickly to the gutter where it discharged through a down pipe into a nearby surface-water gulley.

Before the work of enclosing the site was put in hand, a guard was fitted to the house roof above to prevent snow from falling and damaging the glass below. The snow-guard consisted of stout, square mesh, galvanised pea-guards carefully straightened and supported by iron brackets bent to shape and fixed with galvanised screws to the facia board to which the gutter is attached. An illustration, Fig. 5, is given for those readers who might require a similar device at some future time. Before erection, the brackets were given two coats of aluminium paint.

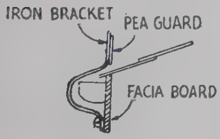


Fig. 5

The end posts and door posts consisted of 3×3 in. prepared yellow deal, the top and bottom plates of 3×2 in. and the window sill of $5 \times 2\frac{1}{2}$ in. stuff sloped off at the front and provided with a weather groove under the front edge to prevent entry of water. The front was provided with a casement window, while the roof was fitted with a ventilator.

The intervening space between the bottom plate and the window-sill consisted of $\frac{3}{4}$ in. tongued and grooved V-matching and similar material formed one side. The sash bars were spaced to suit the width of best quality horticultural glass of stock size. A purlin, or long horizontal support, consisting of 3×3 in. material was placed in the centre immediately under the roof sash bars to take the weight and prevent the roof from sagging. After erection the structure was primed with red lead paint, glazed and then given a further two undercoats and a final coat of lead oil paint.

A small lean-to shed, with the floor well above the ground, was built against the coal cellar wall. In this were housed garden tools, carpenter's tools, paint pots, and other handyman's items.

EQUIPPING A SMALL MODERN HOUSE

Let us suppose we are dealing with a house of, say, two reception rooms, kitchen, three bedrooms and bathroom, and that there is need for economy. True economy in the long run, assuming that the house has been purchased or taken on a long lease, may involve more outlay than is at first thought reasonable. It is better to pay the price for durable goods, even if everything cannot be bought at once, than to have to make early replacements.

Floor Coverings.—Start with the floors. Consider the possibility of putting down parquet in the living rooms. This is obtainable in thin layers of a variety of hardwoods, all ready for fixing, at a price comparable with that of a good carpet with the felt underlay that a good carpet deserves. It lasts, it requires a minimum of labour in cleaning and it looks well, with or without rugs upon it. And rugs of the right shape and design can be hand-made in the home nowadays. Fig. 1 shows a typical example of such a rug. Their tendency to slip can be overcome by mounting them on non-slip backing.

An alternative to parquet is an oak floor such as that illustrated in Fig. 2. Linoleum, preferably of the thick, spongy variety, is specially suitable for bedrooms and is almost a necessity for the bathroom. Even those who prefer a fully carpeted bedroom will find it expedient to lay a surround of linoleum. It is more lasting, and more easily cleaned than stained floor-boards, though, if the flooring is sound staining can be satisfactory.

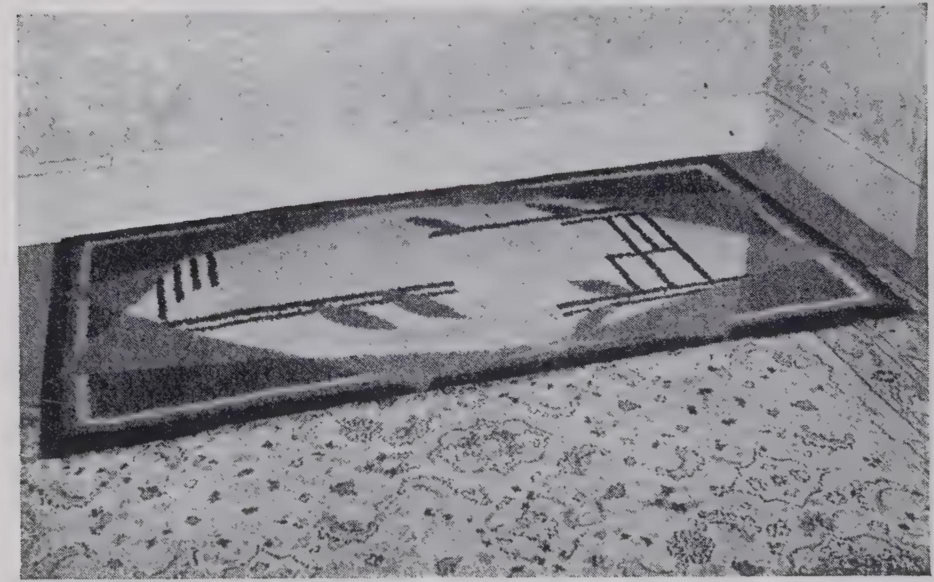


Fig. 1

Linoleum should be fixed with paste to concrete flooring only. When laying it over boarding, especially if new, tack it down, over a paper-felt underlay, with brads designed for the purpose.

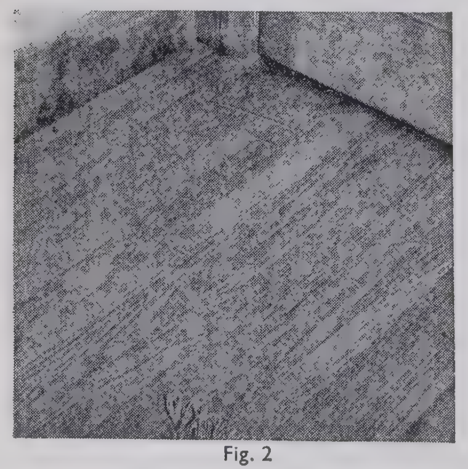


Fig. 2

This will eliminate the possibility of bottling up damp and starting dry-rot. If the joint between the floor and skirting is not already rounded, it can be rounded by bradding on lengths of wood beading of quarter-circle section, running the linoleum up over it and forming a neat finish with a small beading, also obtainable in lengths from the woodwork shop.

The existing kitchen floor may be of wood, cement or tiles. The first is not easy to keep clean, the last two are cold to the feet. There is nothing to equal rubber flooring here. It may be had in many colours, plain, variegated or patterned like tiling.

Stair carpet shows unequal wear and should be taken up and relaid in a different way periodically. Rubber stair carpet is now obtainable and may be bought in a continuous length or in separate pieces to cover the tread and nosing of each step.

Wall Treatments.—Treatment of the walls depends to a certain degree on the age of the house. If the house is new, the walls are certain to be not quite dry and, in drying out, may stain the wall-covering.

The wisest course with new walls is to start with plain distemper, preferably one of the oil-bound water paints. Dark tones should be avoided, particularly if the room is none too light. Many consider there is nothing so satisfactory as a buff tint, which is not only cheerful but forms an excellent background for pictures. If there is a preference for different tints in different rooms, keep them delicate and do not use violent contrasts, which have the effect of apparently decreasing the size, not only of the rooms but of the whole house.

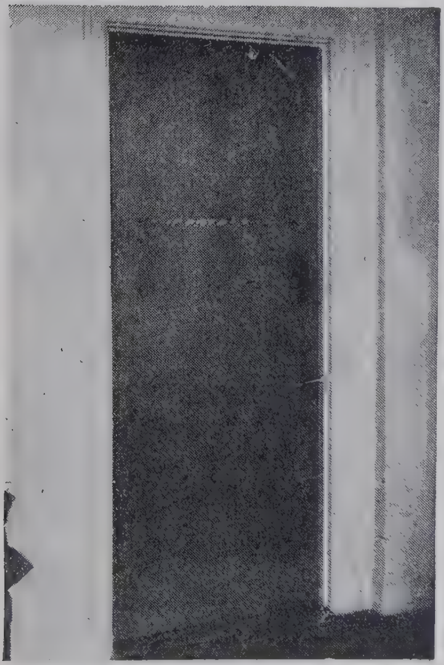


Fig. 3

Wallpapers can be substituted after a year or two if desired. Conversely, if paper already exists, but its pattern is not liked, distemper may be applied on it after a coat of sealer, and possibly renewed once, after which it will be a case for stripping. If you choose a patterned design, remember that the smaller the room the smaller should be the scale of the pattern. There is a vogue for coloured ceilings nowadays. The hint about keeping the tints on the light side particularly applies here.

For dining-rooms and sitting-rooms, if means permit, wood panelling may be considered. It is obtainable in thin layers of solid wood or as plywood with or without beading for the joints. For the kitchen and bathroom walls, white tiles are ideal; but an effective substitute is found in white gloss-enamel made for walls. If it is of cellulose lacquer, which is practically everlasting, the wall must be perfectly dry and a sealing coat be first applied.

Cellulose lacquer is, indeed, an excellent finish for all woodwork that has to be painted. However, the less paintwork to keep clean, the better the housewife will be pleased. Hence, the popularity of flush, laminated wood doors as represented in Fig. 3, with chromium, oxidized or hardwood fittings. Window-sills, if not in hardwood, should be of tiles. Paintwork, however good, is bound to get dirty and scratched.

The Windows.—You may have to deal with both sash and casement windows. Since blinds are out of fashion—if they must be used, a spring-roller design is worth paying for—draw-curtains will probably be required, and these give scope for individual taste in material, design and arrangement. Deep sash windows often lend themselves to floor-length hangings and formal pelmets; shallow casements look attractive with window-length curtains and a simple frilled valence.

It is worth while going to the expense of installing metal runways and roller-hooks for curtain fastenings; they save tears, time and temper. The curtain fabric itself should be of some fadeless washable material, stout and preferably lined. For rooms that happen to be overlooked, subsidiary curtains of a light net, in one of the many admirable patterns, hung with curtain rings from light rods fixed just above head-level, will form an efficient screen without excluding too much light. Alternatively they may be hung from spring coiled wire, but this rusts easily and hangs up when the curtains are pulled.

Lighting Points.—Lighting may be arranged in numerous ways. It is desirable to have ample light in working quarters. There should be a point over the kitchen sink as well as over the kitchen table. A shaving light in the bathroom is a boon. Indirect lighting has done away with the heavy shadows. Often lighting is concealed within the cornice rail, and even if this is not practicable, tubular lamps, with or without concealing reflectors, may still be employed. It is, however, an advantage to have a wall plug to serve a portable lamp for close work.

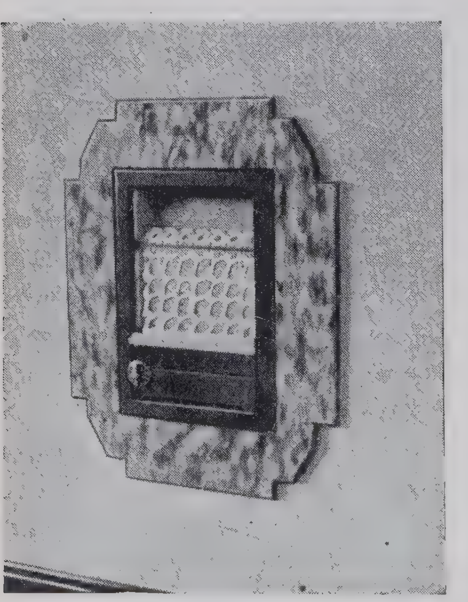


Fig. 4

In passages and stairways it is advisable to have two-switch control systems. In bedrooms, the principle may be applied to the door and bed switches. Nowadays, houses are sometimes provided with wireless points in several rooms. It is important to ascertain that the wiring of the circuits carries a fuse to avert fire-danger.

The possibilities of gas lighting are not so great, but by-pass burners in conjunction with gas switches (plungers operating pneumatically through very fine brass tubing that may be run any distance) make gas nearly as convenient as electricity.

The modern house is usually equipped with gas-points for fires, and an inset fire such as the one depicted in Fig. 4 is favoured by many. There are, however, kinds that can be removed in favour of a fire of coals, the flexible gas tubing should be fitted with the kind of terminal that plugs in and automatically cuts off the gas when withdrawn. A gas poker with a similar fitment will make the starting of the coal fire very easy. A gas iron, Fig. 5, also offers possibilities where electricity is not available.

There is an increasing tendency to plan the dining-room and kitchen with the fireplaces back to back, and to fit an oven and hot-water boiler between so that the heat from either fire will serve them. An interesting innovation combines with the duplex firing facilities

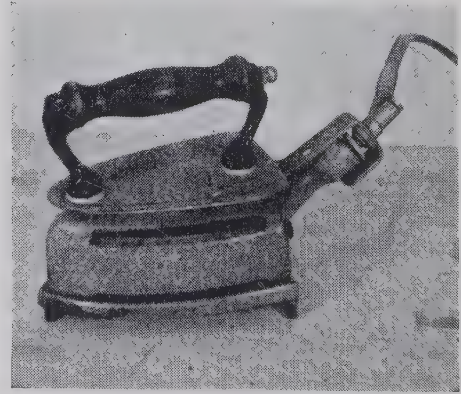


Fig. 5

doors and shelves so disposed that they form an enclosed hot-plate-cum-hatchway between the two rooms. A hatch is one of the most labour-saving devices in domestic equipment. The best substitute is a trolley dinner-wagon. See that the wheels are large and tyred with rubber, so that it may be moved about with ease.

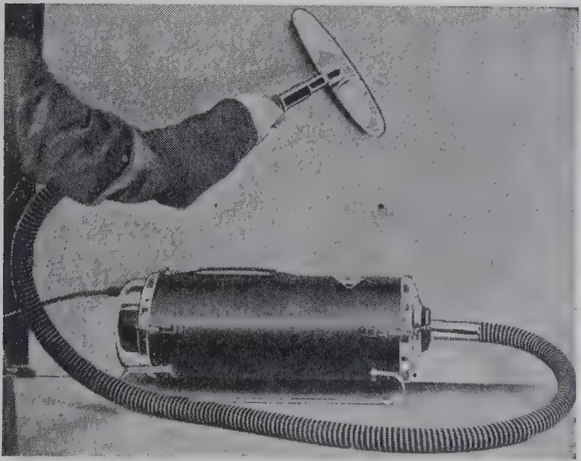


Fig. 6

Hot Water.—If a separate boiler is installed for supplying hot water to kitchen sink and bathroom, let it be large enough to supply one or two bedroom radiators and a hot cupboard as well. The additional cost of boiler and fuel will be trifling, and that of piping and radiators will be paid for in a year or two by saving on other forms of heating. Alternatively, there are sitting-room fireplaces that serve a small radiator in the room directly above at no extra fuel cost whatever.

Solid fuel independent boilers of the slow combustion kind are little trouble to run once the knack has been acquired, but even that may be saved by the use of a gas-fired hot-water storage system, which is equally efficient but rather more costly in operation. Whether such things as the totally enclosed slow-combustion cooking-range and refrigerator are to be regarded as luxuries or necessities depends largely on the number of persons normally living in the house; if it is fewer than four, it would take some years of economy to pay off the rather heavy outlay. A vacuum cleaner, Fig. 6, is a necessity.

The things to consider when spending extra money are easy chairs and beds. Whether the beds should be divans, which are space-saving and allow the bedrooms to be used also as sittingrooms, is a question for personal choice. Bedroom chairs may as well be of the semi-easy type.

Washstands are disappearing in favour of fitted wash-basins, as represented in Fig. 7. These are neatly placed in corners or recesses and completely enclosed with doors. See that every basin waste is fitted with a trap.

Built-in basins bring up the question of built-in furniture. Divans may be built into recesses; make a permanent platform of timber, 8 in. or a foot above the floor, to take a box-spring mattress and the thing is done. Recesses are obvious places for hanging cupboards, doing away with wardrobes.

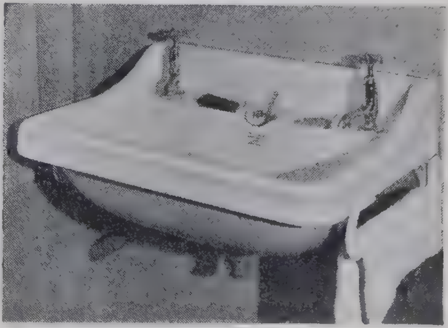


Fig. 7

STAINING AND VARNISHING FLOORS

BEFORE applying the stain and varnish the condition of the floor-boards must be examined and repaired if necessary.

The long edges of the boards of an old floor very often will be found to project above the remainder of the board due to curling. If this is so, the boards should be carefully levelled with the aid of a sharp smoothing plane.

If possible use the plane in the direction of the grain and in any case do not set the plane iron too deep. Before using the tool it will be necessary to punch down the heads of the floor-brads below the surface. This should be done carefully, as any brads left unpunched will cause havoc with the cutting-edge of the plane iron.

In some instances it will be found that gaps occur between adjacent boards in which case the recesses should be filled by gluing in narrow strips of wood, sawn and planed to fit them. The strips should be made so that they project a trifle above the surface of the boards, the surplus wood being planed down level after sufficient time has been given for the glue to dry.

Knots projecting above the surface of the wood should be levelled carefully with a sharp chisel.

Having prepared the floor in the manner described the parts to be stained and varnished should be smoothed first with a medium grade glass-paper.

Remove all dust as any grit and dirt allowed to remain will spoil the work.

Staining.—Do not be tempted to use a spirit varnish stain—which is a preparation of stain, methylated spirit and varnish, as this material when dry does not stand up to hard wear and it has the further disadvantage of showing a pronounced white mark when even slightly scratched. It also chips very easily. So use a good quality oil stain and apply it with a soft flat brush or use a clean soft cloth, moistened with stain.

Water stain is not recommended for use in rooms where the appearance of the surround is of great importance, as soft wood absorbs it so rapidly that it is likely to make the colour darker than that required.

It is a good plan to have the colour of the surround slightly darker than the predominating colour of the carpet or the lino square. This arrangement will give a much better effect than having the wood of a lighter colour than the floor covering.

Having applied the stain, allow it to dry thoroughly before attempting to put on the varnish.

Use a soft brush for varnishing but do not proceed with it if the temperature of the room is much below 60 deg. F. If necessary use an electric stove or an oil stove to raise the temperature. This will allow the varnish to flow on smoothly without any tendency to drag.

In applying the varnish see that the surface being treated is covered by one application of the brush, and be sure not to leave any part uncovered.

Allow at least a week for the varnish to harden before treading on it or putting furniture on the surface.

It may be mentioned that it is useless to attempt to apply stain and varnish to a floor that is in a very bad state of preservation. In this case the difficulty can be overcome by facing the surround with thin plywood, about $\frac{3}{16}$ in. thick.

This material is inexpensive and is simply fastened down to the floor-boards by ¾ in. panel pins. If this method is resorted to, make sure that the ends of the pieces butt together closely so as not to leave unsightly gaps, and do not forget to place the best side of the plywood uppermost.

Plywood can be stained and varnished.

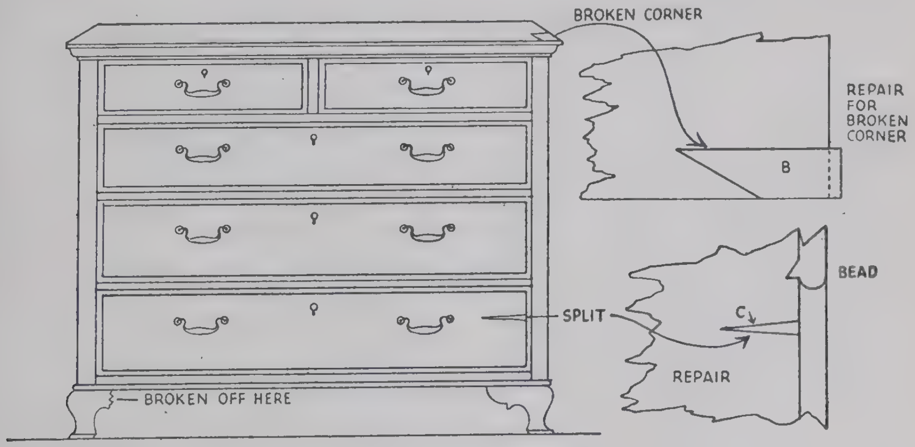
Those who prefer a very dark surround of a semi-matt finish can obtain it by applying japan-black thinned with a little turpentine.

Before applying the japan, however, it is wise to give the floor-boards a coat of size to prevent excessive absorbtion.

The surrounds of unimportant rooms can be stained with a solution of permanganate of potash and water. This mixture although purple in colour gives a brown tint, the shade depending upon the strength of the solution.

RENOVATING OLD FURNITURE

Renovating and restoring old furniture is interesting work, but great care must be taken not to destroy the character and craftsmanship of the old work. For instance Chippendale invariably worked in Cuban (Spanish) mahogany, and his furniture was made and carved out of the solid wood. Sheraton, another famous furniture designer of this period, worked in Honduras mahogany. These two facts are of great help in determining the style and maker of an old piece of furniture.



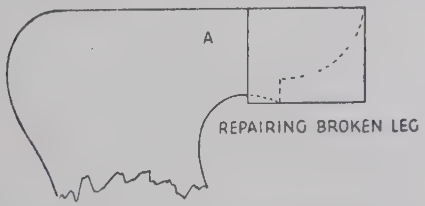


Fig. 1

The Cuban mahogany is hard, dark in colour and shows flecks of chalk in the grain. Honduras mahogany is much lighter in colour and the grain runs in streaks in opposite directions.

This article describes how to restore and renovate a Chippendale chest of drawers, and this description may also be followed in restoring solid mahogany furniture of later periods.

First of all, take off the drawer

handles, locks, etc., and identify them by numbers so they can be easily replaced.

Next, take out all the drawers and thoroughly wash every part with hot soda water. This will remove all the old polish if it is genuine Chippendale and has not been repolished with french polish; in the latter case, it must be washed again with American potash. When doing this, do not get the potash on your hands as it may take off the skin.

Repairing Faults.—Having taken off the old polish, all defects, fakes, splits, etc., will be disclosed, and so it will be necessary to look at every part and repair them where necessary.

Generally speaking, the drawer bottoms usually require repair. To effect this, take them out and rejoin them.

Again, the dovetails in the drawers may have broken loose; in this case, soak off all the old glue in hot water and glue them up again with hot thin glue.

The more common faults, however, are found in the carcase. If there are any cracks in the back they must be "shivered up." This is done by gluing in thin strips of the same kind of wood.

The drawing A in Fig. 1 shows how to mend a broken leg by turning the chest upside down and examining the fixing of the leg. These legs generally break off where shown. Chisel the broken surface carefully and test for squareness.

Saw out a small piece of Cuban mahogany to the required size, glue and cramp this on firmly with wooden hand-screws, allow twelve hours for the work to dry and then bow saw and carve it to shape.

Now supposing a corner is broken off as shown at B, proceed by carefully sawing out the broken corner in dovetail form, as shown. Pare down the edges perfectly square and bevel off the end of a narrow piece of Cuban mahogany. Fit this in, then glue it, tap it in gently and allow twelve hours to dry. The projecting piece should be sawn off to the dotted line, afterwards.

Next, turn over the chest and carve the moulding and clean off.

Splits in the front or sides of the drawers are best "shivered up" with wedge-like pieces, as seen at C. Glue these in and clean up.

Now wash the chest in American turpentine to kill any wood-worms. Look for worm holes and ruthlessly cut out the infected parts, making good with Cuban mahogany as described before.

When the work is complete, carefully paper up every part with Nos. 1½, 1, 0 and "flour" glass-paper. Take care to paper with the grain.

Staining and Polishing. — Then make a saturated solution of bichromate of potash mixed with hot water in the proportions of 3 oz. bichromate of potash to 1 pt. of hot water.

Stain the whole chest with this, allow to dry, then with canvas rub off the yellow powder that will have formed on the surface.

Next, mix genuine beeswax polish—i.e., "wet wax"—as follows: 4 oz. beeswax to ½ pt. of American turpentine and a piece of resin the size of a marble. Melt these together in an old tin on the gas stove, with the gas jet turned low.

Allow the mixture to cool, then work it well in the wood with a brush, rags, etc. Give it a good polishing with coarse canvas and then with a silk cloth.

Locks and Handles.—Thoroughly oil the locks and screw them on to the drawers.

The handles should then be put into very strong boiling soda water, thoroughly polished, washed in soap and water and rinsed in warm water.

It would spoil the appearance of the chest to put the handles on in this polished state, so purchase similar quantities of hypo-sulphate of soda and of perchloride of iron and mix them with ½ pt. of hot water. Immerse the handles, boil them for a few minutes, take out, rinse in cold water and screw them on.

To make the drawers run easily, smear the sides of them—the runners and guides—with polish.

FITTING A TRAP-DOOR FOR A CEILING

MANY modern houses are not provided with an entrance to the loft or roof-space. If the householder wishes to make use of this space, the provision of a trap-door entrance can be effected cheaply and efficiently. The following points should be considered before beginning work:

The making and fitting of a trap-door necessitates the cutting away of certain ceiling joists, and it is essential to choose a position where the removal of part of the joist or joists will not decrease the ultimate strength of the ceiling to any appreciable extent. Another point is that however well a trap-door may be fitted it does not help the appearance of a room. For this reason the bathroom or passage ceiling might be used. If the choice rests between the two, select the latter as the ceiling of a passage is well supported by the walls on either side.

Before the joists can be cut it will be necessary to remove part of the lath and plaster ceiling and, as this is a messy job, the floor should be protected wtih dust sheets. Its covering can be taken up and removed for the time being.

The first thing to do is to pencil guide-lines on the ceiling indicating the size of the opening, bearing in mind that the aperture should be large enough to enable trunks, pieces of furniture and odd lumber to pass through. It may be that the joists are arranged as shown in Fig. 1, in which case it would be possible to obtain an aperture 2 ft. 6 in. wide and nearly 3 ft. in length by sawing through and removing the piece of the centre joist indicated by A in the illustration.

Finding the Joists.—Before actually marking the position, however, it is necessary to locate the centre joist and the inner faces of the two outer ones, B and C. This can be done by tapping the centre of the ceiling with a light hammer. The ceiling will sound hollow except at the position of the joist. When the centre joist has been located, insert the blade of a bradawl to find the edge and from this point measure a distance of about 16 in. Insert the bradawl again to find the inner face of B and repeat the operation for locating C. Measure equal distances from each wall to give the width and draw guide lines parallel to the wall. Along these lines make a series of bradawl holes about ½ in. apart, as shown in Fig. 2. Then insert the blade of a pad saw near the inner face of one of the outer joists and cut through the laths and plaster, using the edge of the joist as a guide for the blade. Do the same at the other joist and with an old wood chisel sever the plaster between the holes made by the bradawl. If this is done carefully the surrounding plaster will not be damaged, so eliminating extensive making-good. The unwanted laths and plaster can then be removed. A dustpan held near the ceiling will catch loose material.

Now cut the centre joist. Squared guide lines should be marked at the correct position prior to the cutting, as this joist must not be sawn irregularly.

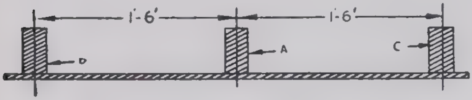


Fig. 1

Lining the Opening.—The aperture is now ready to receive the lining, Fig. 3, that surrounds the space and supports the trap-door. This is really a shallow box minus a bottom, and can be made from planed deal 4 in. wide and $\frac{3}{4}$ in. thick. Screw the sides and ends together and brace the ends by fastening pieces of thin batten diagonally across those members to keep it square. Then screw the lining to the joists after boring the necessary clearing holes in the box to take the screws. The bottom edge of the lining must be flush with the underside of the laths.

As it is essential that the frame be quite square, it may be necessary to place thin slips of wood between the joists and the outer faces of the frame.

Strips of wood $1\frac{1}{2}$ in. wide and about $\frac{1}{2}$ in. thick are then bradded to the wide faces of the lining to form a ledge upon which the trap-door rests. The top edge of the strips should be 1 in. below the top edge of the lining.

Making the Trap.—The length and width of the trap-door can now be ascertained from the fixed lining. The finished size should be $\frac{1}{8}$ in. smaller in length and width than the lining to allow for play.

The trap-door can be made from planed tongued and grooved boards fixed together by means of a couple of battens at the back. The thickness of the boards should not be less than $\frac{1}{2}$ in. while the battens should be at least 3 in. wide and $\frac{3}{4}$ in. in thickness. Use screws for fixing rather than nails.

There remains to cut and fix the cover moulding to hide the joint between the ceiling and the bottom of the lining. This can be either a plain or ornamental moulding, according to taste. Plain moulding with bevelled edges looks well and conforms to modern decoration. In both cases the ends must be accurately mitred. Fig. 4 shows details of the arrangement. This completes the constructional work.

Fig. 2

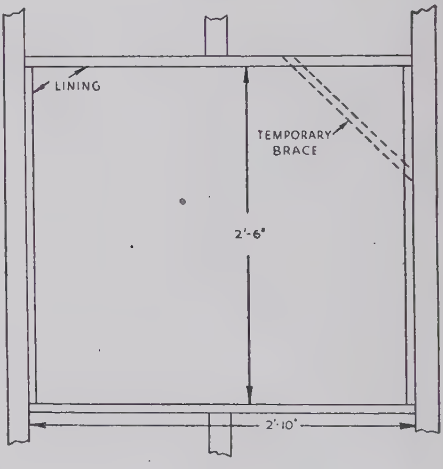


Fig. 3

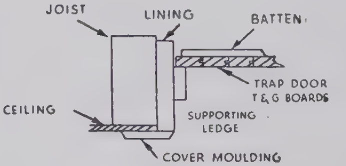


Fig. 4

As the trap-door should be as inconspicuous as possible, it should be painted to match the ceiling, after having treated all knots with knotting and given it a couple of suitable undercoats.

LAYING A NEW FLOOR

Having stripped the floor of all old woodwork, go over the whole of the exposed walls, including the sleeper walls, with a blow-lamp as this is the only means of destroying possible spores of dry rot. At the same time look at the air bricks, the perforated bricks or iron grids placed in the outer walls, just below the floor level. These air bricks may be blocked up. Fresh air is necessary if floors are to be kept in good condition.

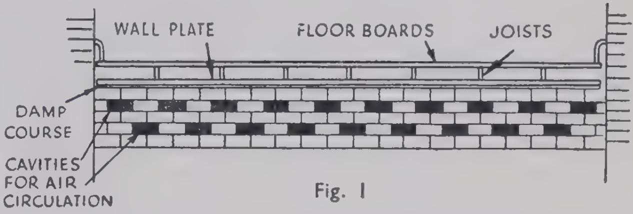


Fig. 1

Now measure up for the new material. The wall plates upon which the joists are fixed are generally of 4×2 in. deal laid in a mortar composed of cement and sand, with a layer of special damp-course bitumen felt between the sleeper walls and the cement.

This prevents damp from creeping up the brickwork and reaching the timber. Fig. 1 shows the general arrangement of the floor.

Materials.—If the floor measures say 14 ft. by 13 ft. giving an area of approximately 182 sq. ft., order two squares (100 sq. ft. = 1 sq. super) because it is usual on such jobs to add 10 per cent. for waste in sawing and the reduction in width of the boards due to the machining of tongues and grooves. The boards should be of the same thickness as that of the original ones, which are generally $\frac{7}{8}$ or $\frac{3}{4}$ in. finished, the difference of $\frac{1}{8}$ in. being the waste due to planing.

The wall plates (4×2 in.) should be purchased in single lengths a trifle over the finished size, and this applies also to the joists which are generally of the same section. Several pieces of skirting will also be found necessary.

If it is necessary to make a joint in the joist, the ends to be formed should be scarfed, and fixed in such a position that the joint is supported by the wall plate, as illustrated in Fig. 2.

A supply of 4 in. cut nails and a few pounds of 2 in. floor brads will be wanted for fixing the joists to the plates and the floor-boards to the joists respectively. In addition, a quantity of portland cement and clean sand will be needed for bedding the plates. Finally, half a gallon of creosote should be obtained for treating the whole of the joists, plates and the undersides of the floor-boards and back of the skirting before they are fixed.

Creosote is an excellent preservative and should never be omitted.

Wall Plates and Damp Course.—Fix the wall plates by stretching and fixing a couple of lines between the walls to indicate the height of the top faces of the plates.

Mix a quantity of cement mortar in the proportion of one of cement and three of sand. Then add water from time to time and mix again so that the whole forms a plastic mass.

Place the bitumen felt in position on the sleeper wall and put a layer of mortar on top, using a bricklayer's trowel for the purpose. Now place the plate in position and tap it down with the handle of a trowel until the top face coincides with the lines. Proceed in this way until all the plates have been bedded in.

The plates should be cut a trifle under size, say about 1 in. less at each end, as the ends must not be allowed to touch any brickwork.

The mortar must now be allowed to set hard. Then the fixing of the joists can be done. Mark the position of these on the top of the plates and fix the joists with 4 in. nails driven in from the sides —one at each side.

Laying the Boards.—Fix the floor boards in the following way: start at one end or a side of the room, as the case may be, and fix the first board, tongue towards the wall, but not touching it. Follow on with the next board, inserting the tongue into the groove of the first, and nail this down at the back edges only and proceed in a like manner until all the floor boards are in position. The remainder of the nails can then be driven in the front edges to complete. Take care to drive the nails in the centre of the joists and in line. Do not allow the hammer to bruise the work. If difficulty is experienced in fitting the tongues into the grooves, persuade them with a hammer; but insert an odd piece of tongued board to take the blows to prevent damage to the edges.

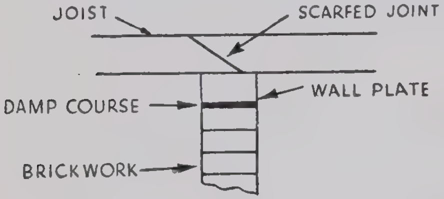


Fig. 2

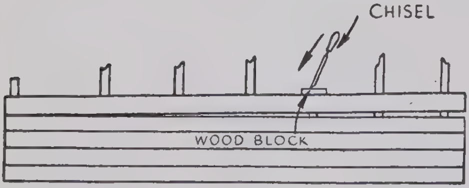


Fig. 3

It is essential that boards should fit tightly at the outset as they will shrink in time and leave unsightly edges.

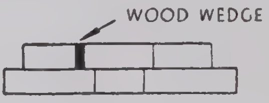


Fig. 4

No difficulty should be experienced in fixing the boards, but it sometimes happens that one is not quite straight, causing trouble in getting the tongue to fit in the groove at the opposite end. To overcome this defect, insert the tongue into the groove at one end and nail the board down at this point. Then prise the board into position by using a chisel driven into the joists as indicated in Fig. 3, as fixing proceeds. A wooden block must first be inserted between the chisel and the edge of the board to prevent damage to the latter.

Do not let the last board touch the wall. Go over the floor and punch the nail-heads down below the surface.

Skirting.—Now fix the skirting-board. Plug the walls at intervals of about 2 ft. by scraping out the mortar of the vertical joints between the brickwork to a depth of about 3 in., cut a number of wedge-shaped plugs and drive them between the prepared joints, as indicated in Fig. 4. Mark the top edge of the skirting indicating the position of the fixings and fix the board with 2 in. cut nails. Punch the nail-heads below the surface.

This completes the woodwork. If the skirting is to be painted or enamelled glass-paper the surface with a medium grade paper and follow with a finer grade, remove the dust and treat the knots with patent knotting. Then give the wood a priming coat of paint consisting of red lead, turpentine and a little linseed oil. When dry, rub the surface with fine glass-paper and give it an undercoat of flat paint. Allow it to dry and surface this coat with glass-paper as before, remove the dust and apply the finishing coat.

If the floorboards are to be covered there will be no need to fill in the nail holes, but if the surround is to be stained, fill in the holes with plastic wood and rub the surface with glass-paper before applying the finishing medium.

FIXING A MIRROR AND GLASS SHELF IN A BATHROOM

THIS article deals with how to fix a mirror with a separate glass shelf, on which brushes and shaving tackle may be placed.

The size of the mirror shown is 1 ft. 8 in. × 1 ft., but the dimensions may, of course, be varied and the mirror placed horizontally if required.

The glass shelf is placed 4 in. below the mirror and the supporting wood brackets are placed directly underneath the side bevels of the mirror above.

Having decided upon the size and purchased the mirror, the first thing to do will be to make the clips. Mirror glass of good quality is about ¼ in. thick. The mirror shown is bevelled, but it may also be purchased with a smooth round edge.

Carefully measure the thickness of the mirror and cut out a strip of hardwood about 6×2 in. and of the same thickness as that of the mirror, and bevel or round the edge of it so as to be an exact replica of the mirror edge. This piece of wood is used to bend over the copper clips which are to be silvered later on.

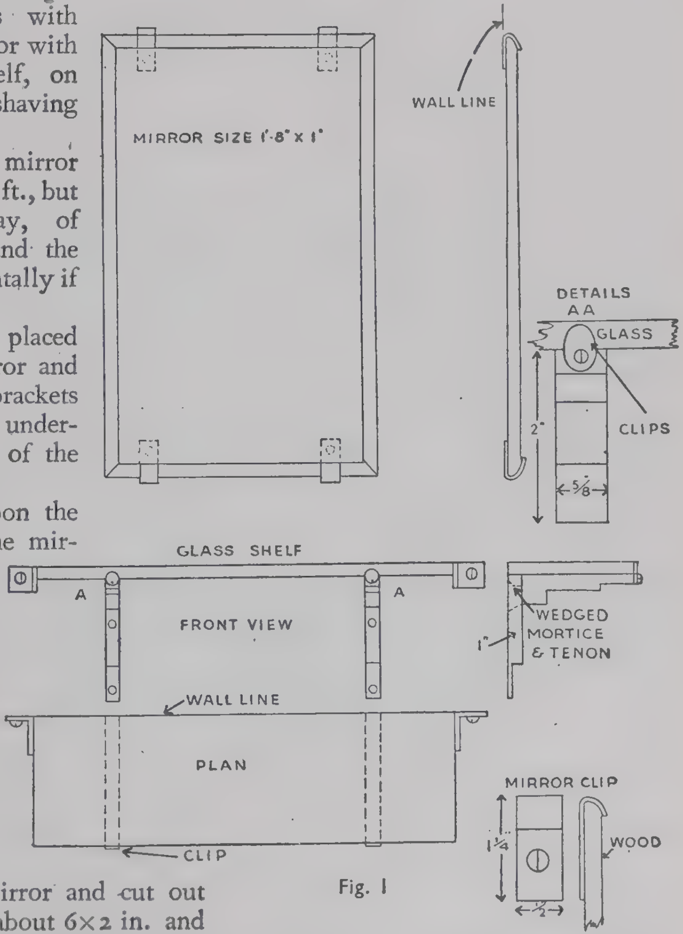


Fig. 1

The Clips.—Make these in the following way: Take a piece of sheet copper, size 8×8 in. (19 B.W.G.) and clean and polish it. Then file a true face edge and gauge a line along the face side and ½ in. from the edge. Square lines across 2 in. apart, as each of the four clips is 2 in. "in the flat."

Find the positions of the holes, bore and countersink them carefully, using a ¼ in. twist drill. Now flatten the copper by tapping outwards with a smooth-faced hammer. File the edges round and clean up the front and back.

If the copper is hard, anneal it by heating it up to redness and plunging it into cold water. Then clean and polish it again. Cut off the ½ in. strip and round the other edge, then cut off the four 2 in. pieces and round the ends.

Now take the little piece of wood and bend over the copper, as shown in the illustration. This can be done with the fingers first and, finally, by tapping the copper over the wood.

Fixing the Mirror. — Hold the mirror on the wall in its position (with the help of a friend), test to see that it is straight, then with a pencil draw a faint line round the edges, on the wall.

Take the mirror down, determine the positions for the clips, hold them in place and mark with pencil as before.

As the backs of the clips are let flush into the wall, take a ½ in. chisel and cut round inside the lines first, then work back to the lines and cut out the plaster carefully to the thickness of the copper.

Now, with a ⅜ in. twist-bit, bore the four plug holes 1 in. deep and plug each with whitewood. Then screw on the four clips. Paste a piece of paper over the screw and clip so that the mirror —which slides in from the sides—will not get scratched.

The Shelf Brackets.—Before fixing the glass shelf, it is best to make the two mahogany brackets first. To construct these, square up two pieces of hardwood each 6×2×⅝ in., for the tops of the brackets, and two pieces each 6×1×⅝ in. for the uprights which are fixed to the wall. Mortice and tenon these together in pairs as shown, take them apart and cut to shape.

Then bore and countersink ¼ in. holes on the upright pieces. Next put the top pieces in a vice, mark, bore and screw on the two oval clips, which prevent the shelf from slipping forward.

These brackets may be screwed instead of morticed. Glue up the two brackets, allow them to dry and clean up and glass-paper with Nos. 1½ and 1.

Carefully cut out two pieces of suede leather (that taken from an old pair of gloves will do), the sizes of which should be 6×⅝ in. Glue them to the tops of the brackets and trim.

Next, find the exact positions of the brackets which should be in alignment with the bevels on the mirror above.

Mark through the holes with a pencil to get the exact hole centres. Bore 1 in. deep holes in the wall, using a ⅜ in. twist-bit and plug up with a tightly fitting round whitewood plug. Saw off the plugs level with the surface wall.

Put the brackets in position again and with a bradawl bore holes in the plugs, putting screws half-way in only.

Purchase some liquid silver paint (not aluminium) and paint the brackets, including the top suede edge allow to dry and screw the brackets on to the wall. Touch the screw-heads with the paint and also the clips.

Fixing the Shelf.—Carefully rest the glass shelf (size 1 ft. 8 in.×6×¼ in.) in position on the brackets and proceed to make the right-angled clips that keep the glass shelf from slipping sideways.

Cut off two pieces of copper 2×¾ in. round the edges, bore ¼ in. holes at one end of each and bend them to slightly more than right-angles, as this will give a hand-tight fit when the glass shelf is pushed in between them.

With the glass shelf held firmly in position, push the clips well up against the glass to get the position of the holes, take the glass down and bore and plug the walls as before.

Screw on the clips, silver them, place the shelf in position and turn upwards the two oval clips on the front edge. These also should be silvered.

GLAZED ROOF VERANDAH

It is sometimes convenient to have a covered space outside the house against the kitchen or scullery where, for example, a mangle or washing machine can be placed, giving more room inside the house. The coal cellar door or any outside bunker for coke or wood may come under this cover for convenience in wet weather.

Outside a living or other reception room a similar addition makes a nice light airy lounge when the weather is unsettled.

This usually consists of a glazed roof supported on posts along the front and sides, and on a wall plate at suitable height at the back. The ends and front may have glass down to about the usual window-sill level and below this the spaces between posts are filled in with weather-boards or brickwork.

The timber work of the front head and gutter board should be arranged at a height that will throw the least shadow across the house windows and when viewed from inside the house, the run of woodwork should not cross the general line of vision. To admit as much light as possible, all timbers should have their narrowest faces inwards and outwards. For example, if the wood is 3×2 in. in section, the 2 in. wide face is on the outside and inside, leaving the 3 in. face to make up the thickness from inside and outside.

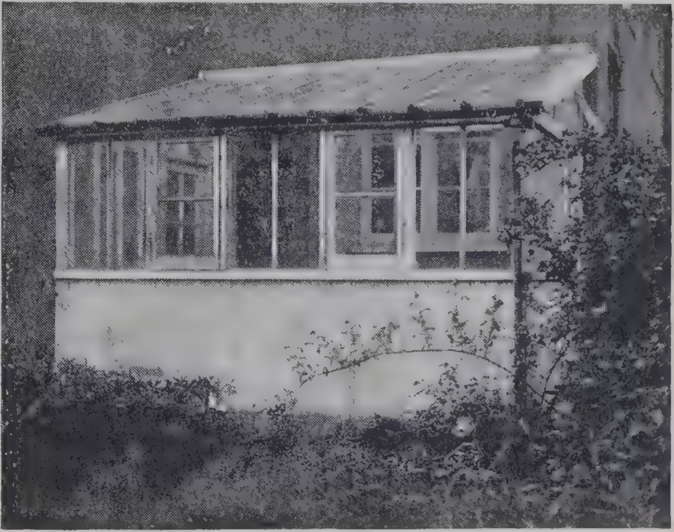


Fig. 1

The Floor is of concrete, either cement or tile faced, and it is suggested that the ends of the posts are bedded in the concrete.

A floor space of about 6 ft. from the house wall to the front and 12 ft. long inside is given as an example in Fig. 2. The roof has a rise of 3 ft. at the back.

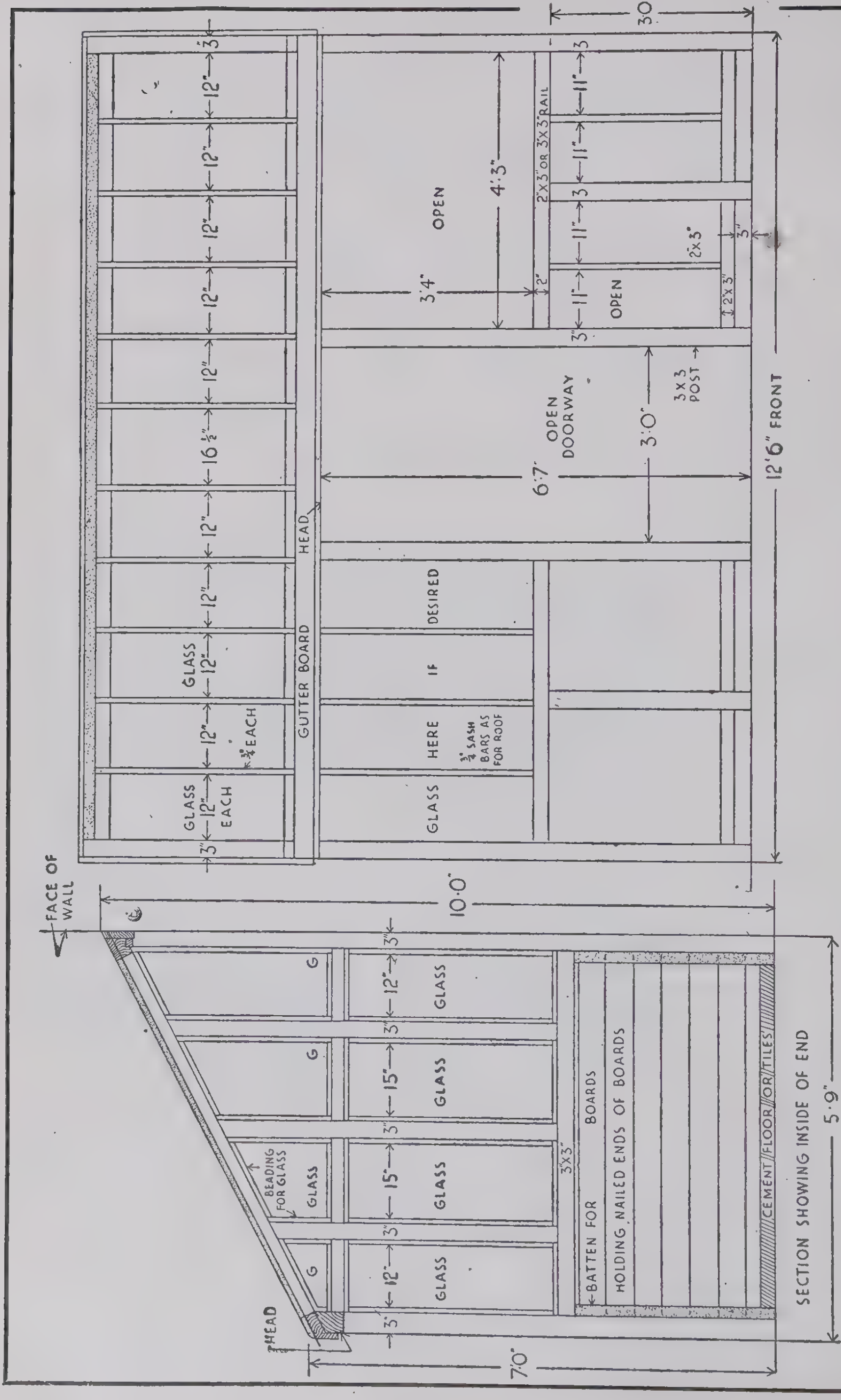

3'0
3"
12"
12"
12"
12"
12"
16½"
12"
12"
GLASS
12"
12"
¾" EACH
GLASS
12"
EACH
3"
GUTTER BOARD
HEAD
OPEN
4'3"
3'4"
2"
2"x3" OR 3"x3" RAIL
3
11"
11"
3
11"
11"
3"
OPEN
2"x3"
3"
2"x3"
OPEN DOORWAY
6'7"
3'0"
3x3 POST
12'6" FRONT
DESIRED
IF
HERE
GLASS
¾" SASH BARS AS FOR ROOF
FACE OF WALL
10'0"
G
G
G
G
3"
12"
3"
15"
3"
15"
3"
12"
3"
GLASS
GLASS
GLASS
GLASS
GLASS
BEADING FOR GLASS
3"x3"
BATTEN FOR BOARDS
HOLDING NAILED ENDS OF BOARDS
CEMENT FLOOR OR TILES
SECTION SHOWING INSIDE OF END
5'9"
HEAD
7'0"

Fig. 2

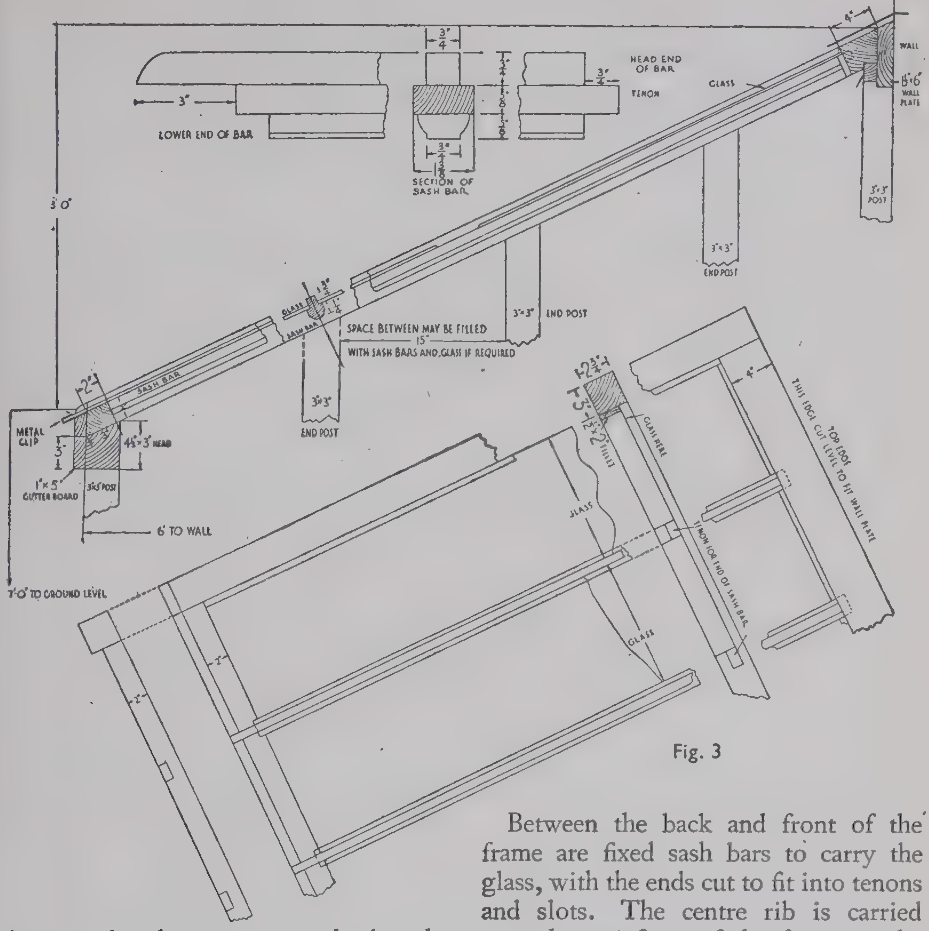

3"/4
HEAD END OF BAR
3"/4
TENON
3"
LOWER END OF BAR
3"/4
SECTION OF SASH BAR
3' 0"
4"
WALL
GLASS
8"×6" WALL PLATE
3"×3" POST
3"×3" END POST
3"×3" END POST
GLASS
SASH BAR
SPACE BETWEEN MAY BE FILLED 15" WITH SASH BARS AND GLASS IF REQUIRED
3"×3" END POST
SASH BAR
2"
METAL CLIP
3"
4½"×3" HEAD
1"×5" GUTTER BOARD
3"×3" POST
6' TO WALL
7'-0" TO GROUND LEVEL
2¾"
3"
1½"×2" FILLET
GLASS HERE
4"
TOP EDGE
THIS EDGE CUT LEVEL TO FIT WALL PLATE
GLASS
TENON FOR END OF SASH BAR
GLASS
2"
2"

Fig. 3

As a guide when arranging the length, it should be noted that the glass is usually 12 in. wide and the sash bars supporting the edges have a rib ¾ in. thick down the centre, spacing the edges of the glass this distance apart, so the complete length should be some number of glass widths plus the ¾ in. ribs in between and the two widths of frame member making up the ends.

From the details in Fig. 3 it will be seen that the roof consists of a framework built up of 3×2¾ in. timber at the ends, 4×2¾ in. for the back top edge, and 3×2 in. along the front. These members are joined by mortice and tenon joints.

Between the back and front of the frame are fixed sash bars to carry the glass, with the ends cut to fit into tenons and slots. The centre rib is carried over the top faces of the frame to the front, as shown. To support the glass at the top end a fillet is fixed inside the frame to correspond with the same depth as the shoulder on the sashbars, and between each bar.

Twenty-one oz. glass, 12 in. wide is suitable. Start at the bottom so that the end overlaps about 1½ in. The next piece and each one to the top overlaps on the sheet below by about 1½ in. each time, in the same manner as slates.

The wall plate is secured to substantial wall plugs. Iron hooks—preferably galvanised—may also be used. Posts are used at the ends.

At the front, posts too are employed to support the head, the top face of which is cut to fit against the wall plate, and the front edge of the frame is cut to correspond to the vertical face of the post. The gutter board also helps to keep the frame in position.

Fig. 2 shows the outside front view of such a construction, closed with glass above and weather-boarding below. A fillet would be required all round inside the posts and sill to nail the edge and ends of the boards to, also a horizontal piece along the ground between posts for the bottom fixing. The top face of the sill bar should be planed so that it slopes towards the front so that water running down the glass will not stay in a pool at the bottom. Fillets are also required all round the other timbers to take the glass which is put in from the outside and finished round with putty.

The Doorway can, of course, be in one of the ends if more convenient (as in Fig. 1) and also fitted with a suitable door with glazed upper panels.

The top edge of the frame is covered by a strip of zinc set into the nearest joint line in the brick wall and bent over to cover the frame to allow moisture to drip on to the glass.

New woodwork should be given a preliminary coat of red lead paint.

A light zinc gutter should be fixed to the gutter board and a 2 in. down pipe of the same material fitted at one end of the gutter to take away surface water.

NOTES ON CENTRAL HEATING

Central heating boilers are self-contained units and are not connected to the kitchen range hot water circulating boiler which supplies the taps of lavatories, baths and kitchen sink.

Fig. 1 shows a suitable form of kitchen boiler for this type of installation. The boiler may be used also for the direct heating of the kitchen since it may have a grate which may be opened when a kitchen fire for airing, toasting or kettle boiling is required.

The fire is in direct contact with the water space which is surrounded by a non-conducting jacket so as to conserve heat. Where it is not desired to use coke, coalite, anthracite or other fuel a boiler can be had of similar type but heated by gas, in which case there is no fuel to be stored, no ashes to be removed and little attention required. Gas companies are now quoting special low rates for gas used for central heating.

Circulating pipes of steel tube are connected from the boiler to the different rooms where radiators of varying heating surface are placed for warming the atmosphere.

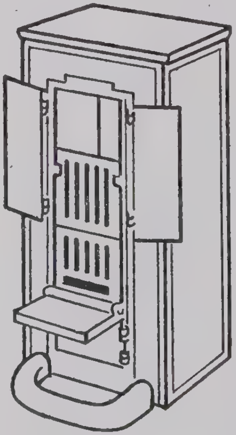
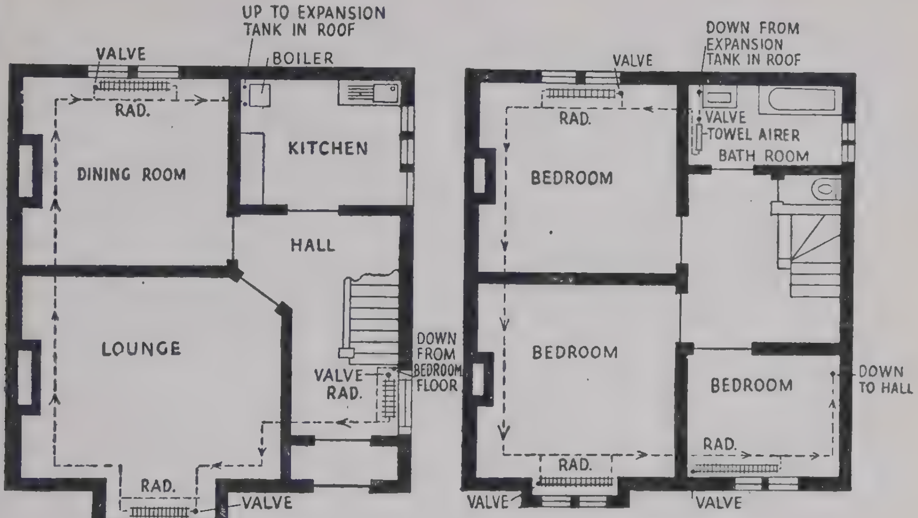


Fig. 1

The Circulation is on the usual thermo principle; the hot water rising from the top of the boiler up to an expansion tank sometimes fixed in the roof or an airing cupboard, provided it is installed above the level of the radiators, then to the radiators themselves and back to the bottom of the boiler. Fig. 2 shows a plan of two floors of a moderately sized house with the position of the central boiler and the radiators marked.


UP TO EXPANSION TANK IN ROOF
VALVE
BOILER
RAD.
KITCHEN
DINING ROOM
HALL
LOUNGE
DOWN FROM BEDROOM FLOOR
VALVE
RAD.
RAD.
VALVE
DOWN FROM EXPANSION TANK IN ROOF
VALVE
RAD.
VALVE
TOWEL AIRER
BATH ROOM
BEDROOM
BEDROOM
BEDROOM
DOWN TO HALL
RAD.
RAD.
VALVE
VALVE

GROUND FLOOR Fig. 2 BEDROOM FLOOR

It is an advantage to arrange the boiler in that part of the kitchen (or even an outside scullery or outhouse) where a direct down take pipe can be run up the corner of the walls to the attic or roof. Where, as in the plan, Fig. 2, the bathroom is above the kitchen—a very general arrangement—the pipe can be taken inconspicuously in a felt-lined wooden casing. It need not stand out from the corner more than 4 in. in each direction. The pipes can then be laid along and at the back of a false skirting or under the floor-boards as in the plan. The main difficulty to be avoided is to so arrange the lay-out that a pipe does not have to curve downwards and rise again (as for instance to pass a doorway) if it can be avoided, since such falls and rises interfere with the easy circulation of the water and may possibly cause air traps which would interfere with the flow. Sometimes pipes have to be laid below the flooring to avoid this and where such is necessary the lay-out should be arranged so that such pipes can lie in the direction of the joists, as cutting the joists to take the pipes weakens the floors, while boring the joist is equally impracticable once the house is built.

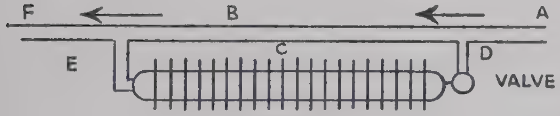

F
B
A
E
C
D
VALVE

Fig. 3

The System.—Because it is desirable that each radiator in the installation shall be capable of being turned on or off at will or adjusted for flow and therefore for heat, it is necessary that these should be coupled to the hot water main in a "shunt" arrangement as shown diagrammatically in Fig. 3. The hot water flows along in the direction of the arrow from A and passes along B, past the radiator and along in the direction towards F. A branch out at D leads to a cock or valve by means of which as much hot water as desired can pass through the radiator and back into the main line at E. When the cock is closed the circulation continues

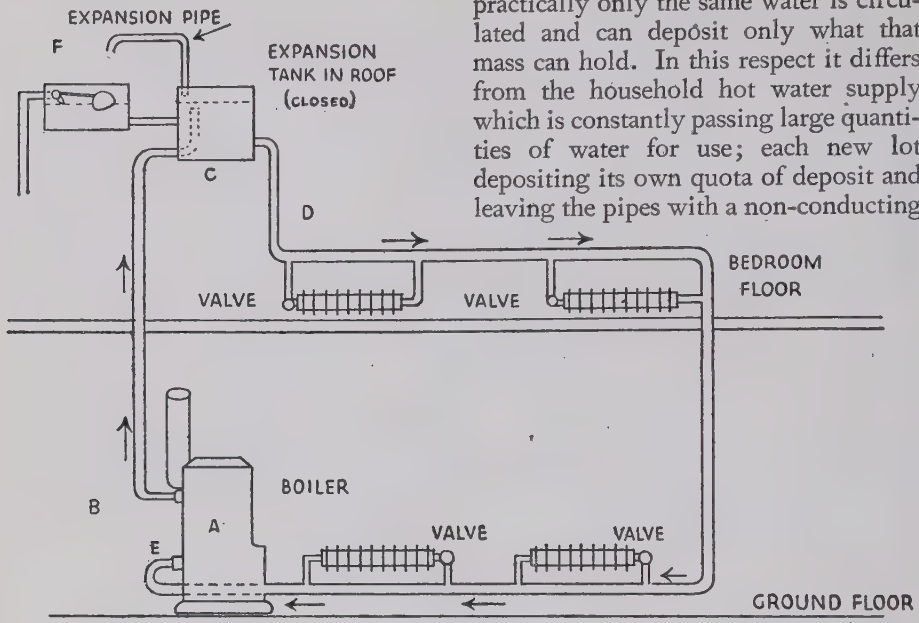


Fig. 4

uninterrupted along to F and the radiator is shut off or, if the valve is partly closed, it is partially cut off. In this way the amount of heat can be regulated or no heat taken to the radiator.

Fig. 4 shows in diagrammatic form the coupling up of the system. A is the boiler, hot water leaving it at B, passing up to the expansion tank C in the loft or attic, from where it falls by gravity down the pipe D and around the bedroom floor and ground floor, back to the bottom of the boiler at E. A ball valve in a cistern F keeps the level of the water in the expansion tank C constant and makes up for any small loss of water through evaporation. Otherwise the system is self-contained as far as the supply of water is concerned, virtually the original mass of water flowing round continually under thermo syphonic automatic circulation.

This feature ensures that the pipes of the system do not get choked by lime or other deposits from the water, since practically only the same water is circulated and can deposit only what that mass can hold. In this respect it differs from the household hot water supply which is constantly passing large quantities of water for use; each new lot depositing its own quota of deposit and leaving the pipes with a non-conducting coating. This undesirable effect is avoided by using virtually the same water over and over again, and the incrustation in the pipes is infinitesimal. The heat conducting properties of the radiator is unaffected while the circulation pipes continue to have full sized bores—not obstructed by deposit which would seriously throttle the circulation and would greatly reduce the heating efficiency of the system.

The boilers are usually fitted with a safety valve in a suitable part of the system so that any obstruction which might cause a dangerous rise of pressure is avoided.

An arrangement can be included by means of which in weather where the temperature is high enough to enable the radiators to be cut off, the system can be still used to heat the water in a supply tank. This hot water is obtained by means of an "indirect cylinder."

Made of copper or galvanised steel it contains an inner heater connected (as are the radiators) to the heating up flow line. The heated water flows through the heater and raises the temperature of the water in the cylinder, where it is stored till drawn off by the taps (bath, lavatory, kitchen, etc.).

Such a system should not cost more than about twopence per day per room with the added advantage, when the indirect cylinder heating as described is installed, of having constant hot water for lavatories, baths and sinks.

CONVERTING THE LOFT INTO A SERVICEABLE ROOM

In many houses there is a loft under the roof, empty except for a water tank in one corner. This space may be turned into a useful room for many purposes—a study, radio den or workshop. Heavy work is, of course, out of the question. It must be remembered that the joists are only intended to carry the ceiling of the rooms below, and if boards are put down above, much walking about and general use might cause the ceiling to crack or fall.

Floor Support.—The safest method is to add extra joists alongside the existing ones to span the space between the walls and to rest on the same wall plates. These new joists should not be fixed in any way to the old ones and must be at least 1 in. greater in depth than the others, so that, when the floor boards are fixed to them, the floor will be supported clear of the existing joists and no unreasonable weight will come on them.

Advantage should be taken of any existing uprights or struts of the roof members to fix a light partition across to make the end walls. The same series of uprights can perhaps be used for the foundation, or line, of the side walls, thus enclosing a space in the centre of the span for the proposed room.

The construction of the roof members and the distance spanned will be different in various houses.

Use Existing Features.—Make as much use as possible of existing constructional features, so when there are no vertical posts at intervals along the length these must be added and it may be possible to fix the top ends to the side of the slanting rafters that run from the roof ridge to the wall plates, while the bottom ends rest on the new joists. When the roof members do not come over or near enough to allow the posts to be fixed to the new joists below, a sill piece or plate should be fixed across at right-angles to the run of joists as in Fig. 3 and the posts attached to this, so that any weight or strain is distributed over all the joists.

If the horizontal members spanning the rafters are too high, suitable timbers can soon be fixed across at a height to give support to the ceiling boards and also allow adequate head room. This arrangement forms a normal rectangular room, but as extra head room is sometimes wanted, it may be better in some cases to have the ceiling boards fixed to the bottom edge of the existing collar beam right down the centre and to include part of the slope in the ceiling as indicated in Fig. 2. The side walls are then carried on a suitable framework set up to cut off the lower parts of the slope, which are useless, unless a built-in cupboard can be arranged.

The Entrance Hatch.—When planning the floor the hatchway must be taken into consideration as the entrance,

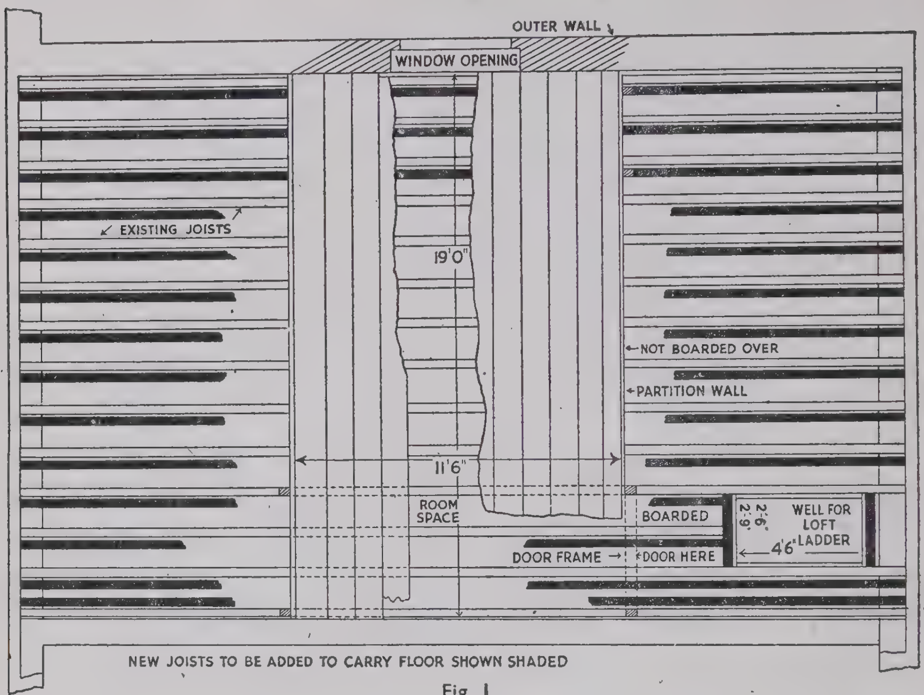

OUTER WALL
WINDOW OPENING
EXISTING JOISTS
19'0"
NOT BOARDED OVER
PARTITION WALL
11'6"
ROOM SPACE
BOARDED
2'6"
2'9"
WELL FOR LOFT LADDER
4'6"
DOOR FRAME
DOOR HERE
NEW JOISTS TO BE ADDED TO CARRY FLOOR SHOWN SHADED

Fig. 1

and this should not come inside the room. It is best to have a floored passage or landing as indicated in the plan, Fig. 1, with the door of the room a little distance away so that one does not step out of the room into the hatchway. The latter is also better railed round with a hinged bar across the opening.

The size of opening should be such that the entrance and exit is safe and comfortable, without the usual scramble. There is also the question of getting material such as wall boards up into the room. The stock sizes of ceiling and wall boards are either 3 ft. or 4 ft. wide, and it must be remembered that the smaller the boards the more joints there will be, and also more battens to be fixed behind to carry the edges and provide something to which to nail them along all joints, even though two edges can be fixed on the width of one run of batten, as shown in Fig. 4.

Having gained some idea of the size of the room, the overall length should be compared with the widths of standard sheets to see how many will be required, and it is as well to give some thought here to the finish and decoration of the room. A panel arrangement of walls and ceiling is effective, or they can be painted, distempered, or papered. As planed battens are used to cover the joints between the sheets in a panelled room, and too many joints will spoil the effect, large sheets will be required to run the width standing on the floor and the length extending up the wall and across the ceiling in 3 or 4 ft. bays. The wall sheets are fixed first and the ceiling last, the meeting joint all round being covered with a wooden beading. Alternatively the ceiling and the top part of the walls can be papered with white lining paper to make a surround above the picture rail and whitewashed as in other rooms.

Wall Boards.—For cladding walls and ceiling, the most inexpensive material is Building Board. This is a manufactured board in sheets of two main kinds, fibre board and plaster board.

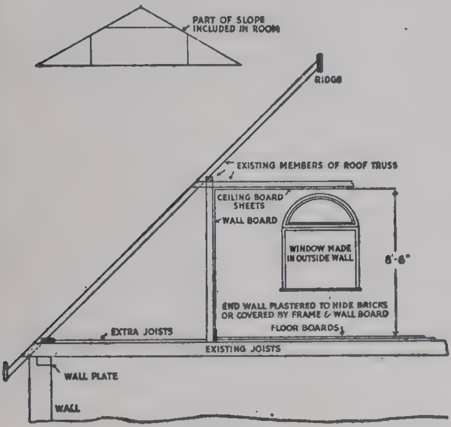

PART OF SLOPE INCLUDED IN ROOM
RIDGE
EXISTING MEMBERS OF ROOF TRUSS
CEILING BOARD SHEETS
WALL BOARD
WINDOW MADE IN OUTSIDE WALL
8'-6"
END WALL PLASTERED TO HIDE BRICKS OR COVERED BY FRAME & WALL BOARD
FLOOR BOARDS
EXTRA JOISTS
EXISTING JOISTS
WALL PLATE
WALL

Fig. 2

Fibre board consists of a mixture of wood pulp and is compressed into solid sheets of stock sizes ranging from 3 to 4 ft. wide ×6 to 16 ft. long, and in thickness from $\frac{3}{16}$ to $\frac{1}{4}$ in.

Plaster boards under various trade names incorporate plaster compressed between sheets of fibre and pulp. They have the advantage of being fire- and vermin-proof and they insulate against heat, cold and noise. They take any kind of finish and are obtained in stock sizes and thicknesses up to $\frac{3}{8}$ in.

The best way to estimate quantities is to measure the size of the room and make a rough plan as in Fig. 5. On this can be marked the widths of the sheets in 4 or 3 ft. spaces along the walls. Also mark the lines across for the ceiling which will give the sizes of the pieces and also the lines of the battens for the panelling. The number of sheets of each size can be found from this. Dividing the total area of wall and ceiling surface by the area of one sheet does not indicate how they must be cut.

The odd 6 in. in the wall height can be made up by fixing a skirting board along the wall and standing the bottom edge of the sheet on this, see Fig. 4. The door and window opening have not been deducted as the sheets are cut to fit round.

If help cannot be obtained when fixing the ceiling, some form of prop, as shown at A in Fig. 3, will be useful to hold the sheet in position while it is nailed. The nails should be galvanised and have large flat heads. These are obtainable from the firm supplying the sheets.

A fine tenon saw is the best cutting tool as it does not tear the edges. Plaster boards are hard on the cutting edge of the saw so do not use your best.

Fixing Wall Boards.—The sheet to be cut should be placed on the floor with lengths of batten underneath to support it in two or three places; one length being just under and alongside the cutting mark to support that part while being cut.

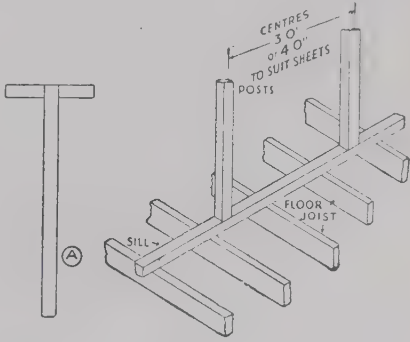

CENTRES 3'0" or 4'0" TO SUIT SHEETS
POSTS
FLOOR JOIST
SILL
Ⓐ

Fig. 3

Commence nailing at the middle and work outwards towards the corners, spacing the nails about 12 to 16 in. apart in the middle of the sheet and about ⅜ in. in from the edges and spaced here about 6 to 8 in. apart.

With fibre board, it is usual to leave a gap of about ⅛ in. between the edges of the sheets to allow for natural expansion, but with plaster boards the joints are butted together. Cross supports or battens are fixed behind to provide firm nailing surfaces for all four edges, the batten being wide enough to serve for two edges; 2×2 in. timber would be suitable.

Against a brick wall the batten framework can be made of timber ⅞ in. thick × 2 in. wide nailed to wall plugs. Packing pieces may be required to ensure a vertical wall.

Filling the Joints.—Flush joints are obtained by filling the cracks with composition cement used in a plastic state, working it well into the joints and finishing flush with a paperhanger's scraper. Rolls of fabric strip 2 in. wide are also supplied for sticking over the joints. As it is fixed from top to bottom, draw the scraper downwards with enough pressure to free it from wrinkles and bring the plastic filling through into the fabric strip, scraping off the surplus.

All nail holes should be filled in with plaster and the places brushed over with shellac. Sizing is not usually necessary with fibre boards. Plaster boards must be sized or primed with a mixture of size, varnish and paint of the desired colour. For distempered surfaces or wallpapers on plaster boards it will be found more satisfactory to use varnish size first.

It is well worth the extra trouble to have a window made in the end wall. For artificial light, electricity is most convenient. The cable can run to convenient points outside the room for both wall and ceiling and only the leads for switches and points brought through, so that no wiring shows in the room. A light should be provided over the hatchway, and for greater convenience the light should be arranged for switching on and off from the top and bottom of the steps.

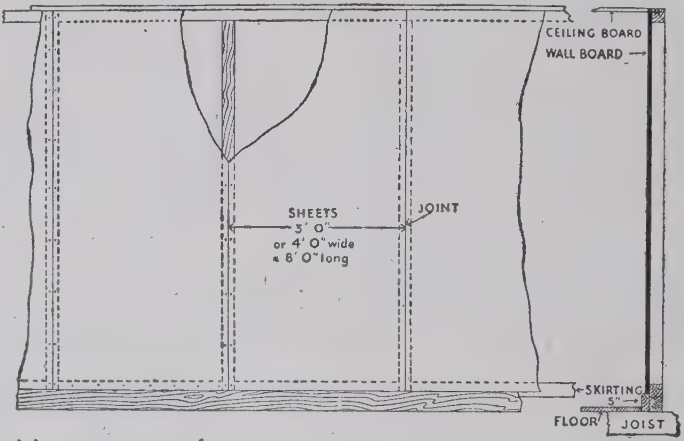


Fig. 4

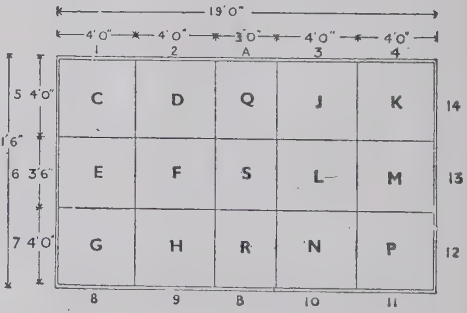


Fig. 5

Water Cisterns often make a lot of noise when filling and can be silenced by means of a length of tube fixed to the valve and extending to the bottom of the tank.

HOW TO DEAL WITH DEFECTIVE CEILINGS

Isolated cracks in ceilings, generally due to settlements in the joists, can be made good when the room is being redecorated, and small patches may be cut out and re-plastered provided the surrounding ceiling is firm.

Treatment of Cracks.—Essential tools are a small pointed trowel, scraping knife as used in paper-hanging, any convenient brush for damping, and a small home-made float as shown in Fig. 1. If a smoothing trowel is available, the metal blade will produce a smoother surface than the wooden one. Another square of wood with a handle grip underneath is useful for holding a supply of plaster while working. Keene's cement is the usual material for repairs. This substance, obtainable in small quantities, should be stored in an air-tight tin in a dry place.

Small cracks do not require cutting out. Scrape away loose fragments and wet with clean water, brushing well into the crack. Then work new cement into place, strike off the surplus and smooth off with the float.

Large cracks need cutting out. First mark parallel lines on each side of the crack and about $\frac{3}{8}$ in. away, following the course of the crack as in Fig. 2.

Use a length of wood placed along one of the pencil lines as a guide. Begin by scraping along it with the point of the scraper, or by using a sharp chisel or knife. Scraping the lines fairly deep prevents the crack from spreading outwards, gives a neat edge and only a narrow slit on the surface if the tool is held to cut under the surface and remove plaster from the back without enlarging the width. A few taps may be necessary to sink the blade through the plaster.

Clear away all loose pieces sticking between the laths. Wet the crack thoroughly and allow the water to reach all the inner surfaces. This is repeated at intervals during the work and should not be neglected, or the existing plaster will draw all the moisture from the new before it has time to set hard.

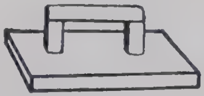


Fig. 1

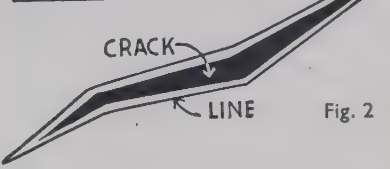


Fig. 2

A clean biscuit-tin lid, a sheet of metal or a flat board for mixing are better than a small bowl as it is easier to scrape all the powder from the outside to the middle where the water is poured. Work the mixture well into a smooth and fairly wet state.

A quantity is taken on the board and pressed, a little at a time, into the open slot, using the point of the trowel to work it well to the back. After a certain amount has been placed in this manner the work is again wetted and another layer added, until the slot is filled. Finish off smooth by the alternate use of a wet brush and a float.

Larger patches are treated in a similar manner by building up round the edge of the cleaned space and working to the centre, getting the plaster well behind the laths all the time.

Ceiling Falls.—When the fall is a large one, test the surrounding ceiling by pressing gently against it with the open hands. Any movement up or down will indicate how much plaster has left its support. Sometimes a large area will sag without falling, and will remain in this uncertain state until an extra shock sends it crashing down. A ceiling in this condition is a menace and should be dealt with at once. The best and cheapest way, especially if the house is near main road or rail traffic, will be to clear the room, cover the floor and strip off all the plaster and laths ready for fixing ceiling board. Take care round lighting fixtures. Withdraw all nails and make good the wall plaster up beyond the old ceiling level. Then start repair work.

Covering with Builder's Boards.—Measure the ceiling for width and length and make a rough sketch on the lines of Fig. 3.

The choice of material rests between fibre board and plaster board. The first is a mixture of wood pulp and fibre compressed into sheets 3 or 4 ft. wide × 6 to 16 ft. long, ½ in. in thickness. The second incorporates plaster compressed between sheets of wood pulp. Standard sheets are the width and length of fibre boards, but the thickness is ⅜ in. Both kinds are easy to saw and may be nailed or screwed in position. It is advisable not to use asbestos sheets as this material is hard to saw by hand, and unless very carefully handled and drilled, breaks and cracks.

On the rough plan, mark off widths of 3 ft., either across the room or from end to end. A 6 ft. length is about the largest for easy handling, so find where the ends of such sheets will come in relation to the joists. One joist can carry the meeting edges of two sheets. It may be more economical to use sheets 4 ft. wide, but with a plain ceiling to be papered before whitewashing, any odd cutting and fitting will not matter.

A panel effect entails extra care in selecting the size of sheets and the run of the battens.

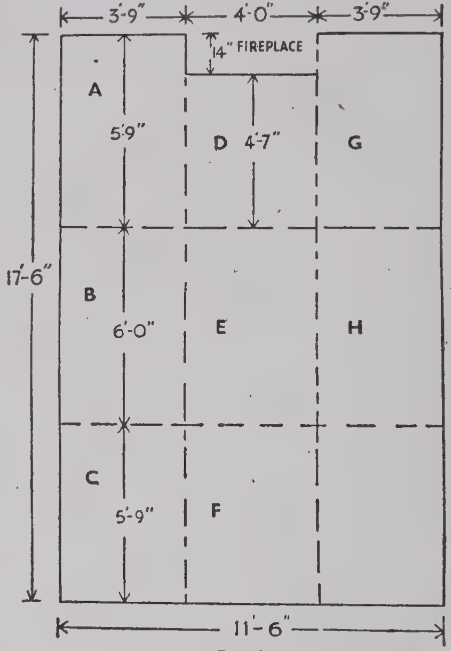


Fig. 3

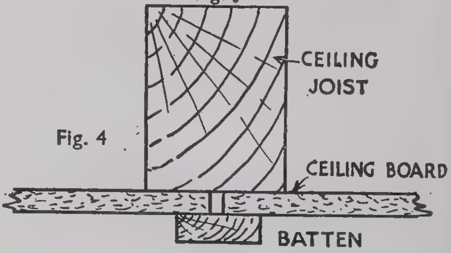


Fig. 4

Fig. 3 is a plan of a typical ceiling area to be covered. After measuring, it was found that the best sheet would be 4 × 6 ft. The actual list was as follows, although an amount of sizing and fitting was necessary afterwards to allow for walls being out of the square in places.

3 ft. 9 in. × 5 ft. 9 in. long ..	4 pieces
3 ft. 9 in. × 6 ft. long ..	2 „
4 ft. × 4 ft. 7 in. long ..	1 piece
4 ft. × 5 ft. 9 in. long ..	1 „
4 ft. × 6 ft. long	1 „

Battens to hide the joints may be $\frac{1}{4}$ in. thick and 1×2 in. wide. They should not be out of proportion to the size of panels. Suggested sizes are: $1 \times \frac{1}{4}$ in., $1\frac{1}{4} \times \frac{1}{4}$ in., $1\frac{3}{8} \times \frac{3}{8}$ in., $1\frac{1}{2} \times \frac{1}{2}$ in., $1\frac{1}{2} \times \frac{3}{8}$ in., $1\frac{3}{4} \times \frac{3}{8}$ in., $2 \times \frac{1}{2}$ in.

At the crossing of the battens they may be halved or if well fitted and secured the ends may butt against the piece at right-angles. It will depend upon the room which way the longest runs are placed to avoid more cutting.

The sheets are best placed on the floor for cutting, with a length of batten underneath in line with the cutting mark so that this edge is well supported. One or two pieces of the same thickness underneath will keep the sheet level. A fine-toothed saw will leave the cleanest edge, but plaster board dulls the teeth.

Galvanised $1\frac{1}{4}$ in. oval brads or French nails spaced about 12 to 16 in. apart in the middle of the board and about $\frac{3}{8}$ in. in from the edges and 6 to 8 in. apart will secure the boards to the joists. Fibre boards are fixed with a gap of about $\frac{1}{4}$ in. between adjacent edges (Fig. 4) to allow for expansion, but plaster boards may be butted together.

Commence covering the ceiling from one corner, nail at the middle of the board and work outwards towards the corners.

Joints between plaster boards may be filled with plastic cement. Over this is placed a strip of fabric about 2 in. wide. This is pressed down firmly and evenly by drawing the scraping blade downwards with enough pressure to bring the cement through the mesh.

Fibre boards may be finished with any kind of wall paint, distemper or enamel. All nail heads are covered with plaster-of-paris and brushed over with shellac.

Varnish size is required on plaster boards before distempering.

STENCILLED DECORATION

A STENCIL is a thin piece of metal or prepared paper in which a design has been cut to allow repeated reproduction of the design by brushing coloured pigments through and on to the article to be decorated.

The variety of design is endless and may be adapted to cupboard doors, waste-paper baskets, lampshades, linen baskets, screens, book ends and covers, cushion covers, bedspreads, and many other articles.

Uses for Stencilling.—Wall decorations include dadoes, borders, panel surrounds, frieze work for the nursery and play-room in animals, birds and familiar characters. On a background of plain or shaded tint, flower groups in the corners and part way along the skirting are effective; suitable and varying designs may show iris, foxglove, delphinium and other flowers. Stencilled wall decorations carried out on large sheets of rush matting secured to the walls by means of stained wood battens are a ready way of dealing with the conversion of a lean-to greenhouse or small conservatory into a rest room, or covering the whitewashed walls of a club room for Scouts or Guides.

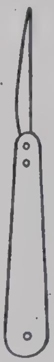


Fig. 1

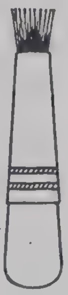


Fig. 2

An old book of wallpaper samples or lino patterns will often provide ideas for stencils. Original designs may be drawn to suitable size with compasses and rule. French curves are handy for many outlines impossible to produce with compasses, and squared paper is another great help with the proportions of a design and enables work to be done without a tee-square. Complicated designs are built up of one or more simple elements repeated or varied, but the simpler ones are most effective: avoid too much detail.

Stencilled designs may be applied to any material that is capable of taking colour or pigment, such as plaster, linen, wood, leather, canvas, paper, hessian, twill and cotton.

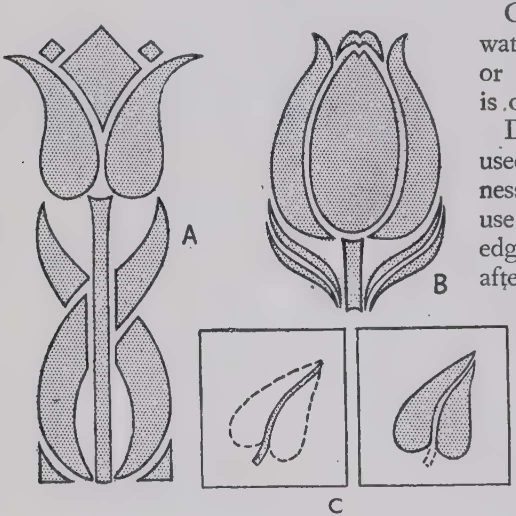


Fig. 3

The Outfit.—The tools are few and cheap. The small knife used for cutting stencils must be of good steel that will retain a sharp edge and point. The ready-made article of the shape shown in Fig. 1 is convenient to handle, but an ordinary penknife may be used provided it has a comfortable handle and a blade of suitable shape. An old one could be ground to shape. The objection to a penknife is that it is liable to shut in slipping, so the blade should be locked in the open position by placing a piece of metal tube over the handle and flattening it to shape with enough projecting forward to prevent the blade shutting.

Small holes are punched with hollow tools made from assorted sizes of steel tubes ground at the ends to make cutting edges.

Any hard surface will do for cutting upon, but wood grain is liable to lead the cutting blade astray. For all-round results, there is nothing better than a piece of plate glass or frosted glass, as this surface gives a better grip. Punching is done on hardwood with a piece of card between wood and stencil plate.

Colours are used in the wet state, so waterproof card or paper is best. Waxed or oiled manila paper for the purpose is obtainable from artists' shop.

Drawing and other papers may be used, and cardboard of various thicknesses; but unless waterproofed before use, the colour will soak into the cut edges and cause smudged work, and after frequent use the stencil will break apart.

Waterproofing may be carried out by treating the cut stencil with coats of varnish or french polish mixture, but these require ample time to dry hard before use. Painter's knotting can also be used and dries quickly. Boiled linseed oil with a little turpentine gives a transparent stencil but requires a long time to dry.

Waterproofed plates allow the necessary cleaning to prevent colour filling small cuts and marring the result. All plates should be cleaned after use.

The usual type of stencil brush shown in Fig. 2 has short hairs, usually hog's hair, in a tuft varying from ¼ to 1½ in. in diameter. Such can be purchased at an appropriate shop, or a clean paint brush may be cut to suit.

Suitable Colours.—The pigments may include stains and dyes, pigments

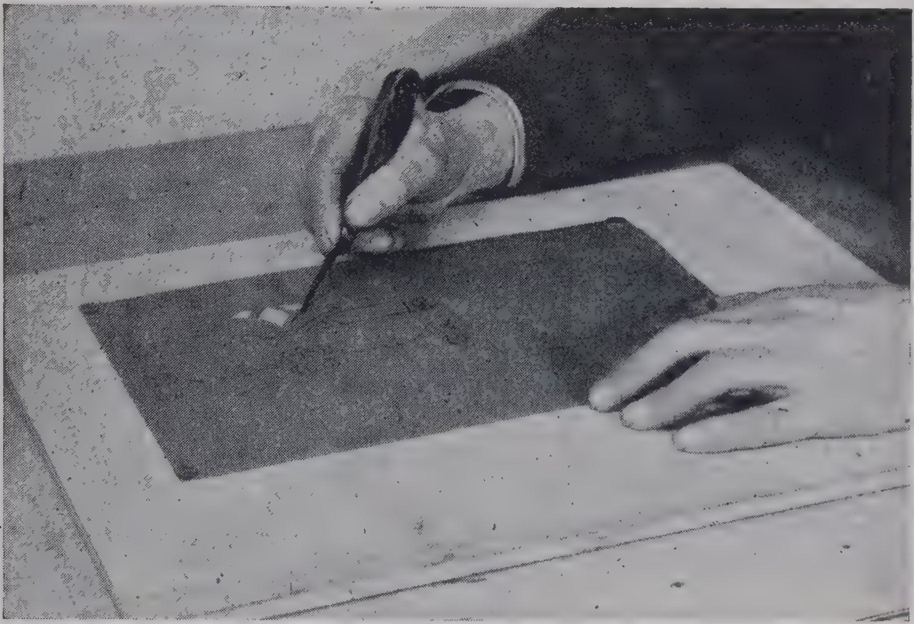


Fig. 4

mixed with oils and varnishes, and those mixed with water and gum.

Artists' oil colours dry slowly and water colours are only suitable where moisture will not affect them. Poster colours in a large variety of colours are waterproof, but waterproof-coloured inks are inclined to spread under the stencil if applied with a brush. The method with these is to use a spray diffuser and, provided the jet is so made that the spray will not fan out over a large space, little material is wasted, although masks to cover portions will be required.

An excellent colouring medium is prepared by mixing powder pigments with the white of an egg, an equal quantity of water and a few drops of vinegar. It takes some time to dry, but sets hard and is insoluble.

Stencils must be cut in such a way that they will not fall apart after cutting. For example, if a circle is marked out by double lines and these are cut all round, the centre will fall out and give a stencil for a large round dot. Centre-pieces must be kept in place by small connecting links left uncut here and there (Fig. 3, A and B). When placing the links in a design, always

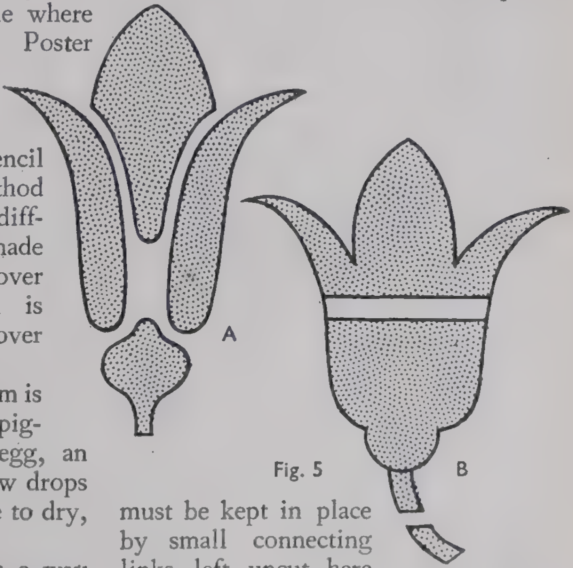


Fig. 5

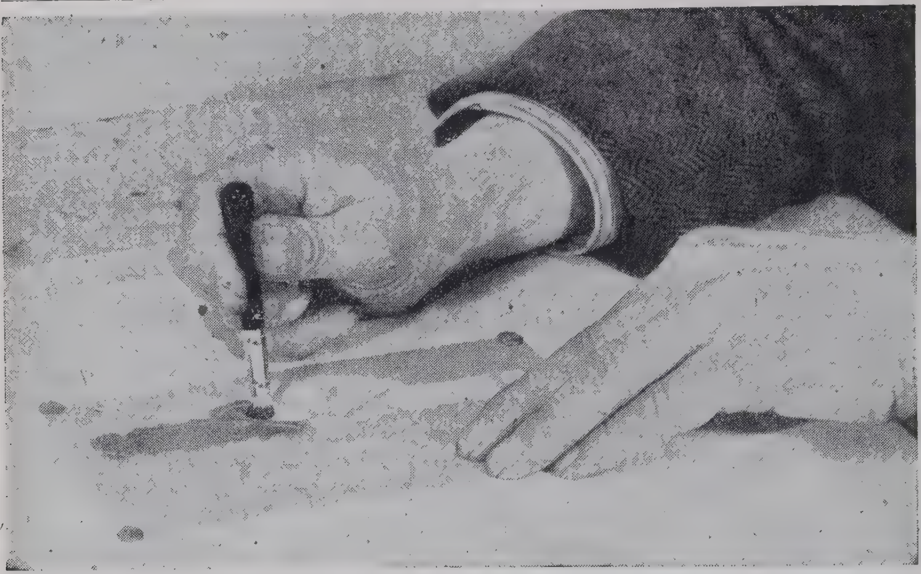


Fig. 6

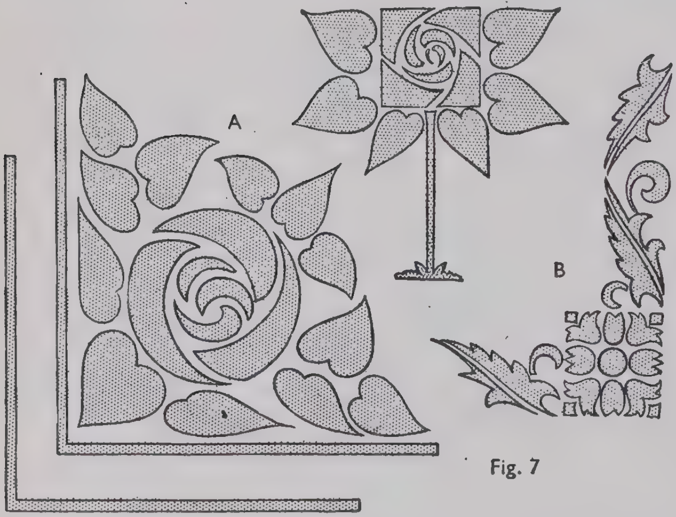


Fig. 7

arrange them so that they help towards the foundation of the design and indicate the desired shape as at A in Fig. 5. The effect of incorrectly placed links is indicated at B, where the result is not so definite.

Reversing Designs.—In the illustrations the dark portions are the parts to be cut out. There are two ways of cutting some stencil details, such as a leaf. In Fig. 3C, the body of the leaf is marked out, leaving the centre rib blank or the same colour as the surrounding background. By marking the plate with a simple border and again cutting out only the dark parts, in this case the background, and stencilling these, the body of the leaf is left blank for filling in with another tint.

When cutting a stencil, the knife should be held as indicated in Fig. 4.

Fig. 6 shows how to apply the pigment. The brush is not drawn across the stencil, as in ordinary painting, but used in vertical dabs.

A modern type of a panel corner is depicted at A in Fig. 7, a suggestion for a wall border is represented at B.

ENCLOSING THE BATH

THE usual cast-iron, silicate enamelled bath with the curled edge is not very attractive in appearance. The bathroom can be considerably improved by enclosing the bath as shown in Fig. 1, where a panelled surround and a neat top edge make it a more pleasing part of the bathroom furniture.

Since the bath is usually placed beside a wall, the panelling need only be on the side and the two ends, and can be attached to the wall at the back. As baths vary in size, not only in length but also in width and depth, specimen measurements only can be given on the drawings.

Figs. 1 and 2 show the completed job. The side is in two panels and the ends have a panel each. The top fits under the overlapped edge of the bath so that the rounded edge of the bath is above the surrounding rectangular frame. The drawing is to scale and is suitable for baths of the following measurements: 5 ft. 9 in. long, 2 ft. 4 in. wide at the widest part and 2 ft. wide at the tap and waste end, standing 21 in. from the floor to the underside of the turn-over edge.

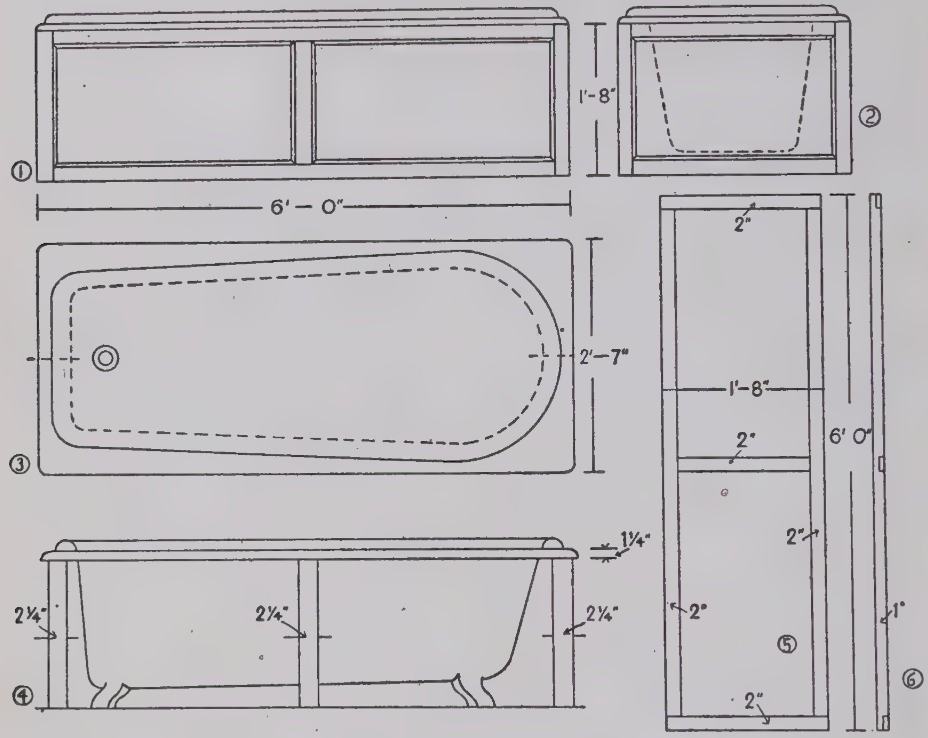
The top board, shown in the plan view in Fig. 3 fits up around the bath and under the lip of the turn over top edges. It would best be made in two pieces of timber of 1¼ in. yellow deal nailed together with a batten at each end so as to make up a width of 2 ft. 7 in. and a length of 6 ft. which would allow 1½ in. each side wider than the widest part of the bath and the same at each end. The dotted lines show the inside edge of the top board where they come near the bath sides.

Marking the Top Board.—The shape to be cut can be marked roughly by smearing the top edge of the bath with a black colouring medium and laying the top board on it.

If the bath is against a wall, the board should be placed close to it. When the board is lifted, the centre of the top curve will be marked on it, and, if roughly cut out with a pad saw 1 in. inside of this marking, we shall have two boards which will fit up around the bath. Let the battens be screwed to the boards and as near as they can be to the two ends of the bath below the turn-over top edge. These battens can be replaced when we come to fit it all up.

The Top Board in two halves, having been prepared and cut to shape, length and width, is placed around the bath and wedged up from the floor with four corner posts, 2¼ in. square; each post coming at such a position that its two outer faces (side and end of the bath) come within 1 in. (full) of the edge of the top board. These posts should be wedged in between the floor and the underside of the top board as tightly as possible. They should be fastened by screws driven in diagonally, from each side, into the floor at the bottom and up into the top board at the top. They must be tested with a plumb before finally screwing up. The corner posts at the back should be nailed to the wall (if the bath fits against the wall) and cut in at the bottom if there is a skirting board.

The top is now in position, Fig. 4, and the posts fixed. Incidentally these should have been painted with red lead before fixing and the top of the board should be nicely planed. At the joint between the two boards (indicated by the dotted lines in Fig. 3) the boards



ENCLOSING THE BATH—Figs. 1-6

should have been clamped together with glue between them and the battens, previously described, nailed up from below. These battens should reach from the wall or back framing to within 1 in. (full) of the front edge of the board. Since the grain here is across the narrow dimensions of the timber of the top board, the value of the batten will be appreciated. A number of thick screws should be used, taking care that they do not come within $\frac{3}{16}$ in. of the top of the board.

Sides and Ends.—All is now ready to fit the side panel and the two end panels. These are made of framing of 1×2 in. timber which may be left rough at the back but planed on the front and sides. The framing is shown in Fig. 5. The front consists of two panels and the two ends a single one; the corners can be made by simply halving the two rails, top and bottom into the upright members. This is shown in the edge view in Fig. 6. The central member is 2 in. as are the ends, and the complete front panelling is of a length to just overlap the upright posts by 1 in. at each end. The end panels are made in the same way.

The width of these panels is made $\frac{1}{8}$ in. wider than the depth between the underside of the top board and the floor. The actual panels are let into the frames and butt against a beading at the back. They are made of $\frac{3}{16}$ in. plywood or $\frac{1}{4}$ in. sound yellow deal. The latter is more suitable. It need be planed only on the front surface and should fit the framing tight and bed against the $\frac{3}{8}$ in. beading $\frac{1}{4}$ in. wide, planted in at the back and be fixed by a round nose beading planted at the front. This panelling should be done before fitting the whole side and ends into place around the bath. Apertures should be left for any pipes to pass through.

Then side and ends are fitted into place and nailed in with sunk-headed brads. The brads at the top should come an inch away from the corner on both sides so that, when all is fixed, the top edge of the top board and the corners at each end of the front can be rounded so that no sharp edges are able to hurt people.

The finish can be as desired. The most appropriate is perhaps a good painting with lead paint and rubbing down, then a coat of dead white also well rubbed down and finally a coat of the finest white enamel.

Panels can of course be of any other shade to match the decoration of the bathroom, but the top board and the framing will, whatever the room decoration, look best in white enamel. This will match the overturn of the bath edge which rises quite naturally from the flat top of the surround.

FIXING FLOOR AND WALL TILES

PREPARATION is necessary before covering a floor area with tiles, the amount depending upon the construction of the floor. If this is the usual boards on joists, the boards must be removed and the joist ends in the door way leading to the adjoining room trimmed and perhaps supported according to the direction in which they run. The space below will require making up to nearly the original floor level with concrete spread over the existing bed already in position over the floor area. The new concrete must be of such thickness that a layer of cement and the thickness of the tiles will bring the surface flush with the floor level in the adjoining room.

Thickness of Tiles.—In some houses the scullery has a concrete floor either a step down from the kitchen or one up from that floor. In the first case, the extra thickness of tile and the layer of cement in which they are bedded will not matter, but where the concrete floor is above that of the next room some thought must be given to the extra thickness of the proposed work. The labour of breaking up and removing the existing concrete cannot be undertaken, so the best way is to roughen the surface to form a key for the cement, lay the tiles, and then—having found out how much thicker the new floor is—add a suitable thickness of board to the top surface of the step which, in most cases, will be of wood, so that it is all level, and then remove the door from its hinges and saw and plane off enough from the bottom to clear the new thickness of step, as indicated in Fig. 1, A and B.

The first step should be to measure the floor and make an outline sketch with the dimensions, and note how these dimensions run out in odd inches—for example, 10 ft. 9 in., 5 ft. 3 in. For a length of floor an odd 3 in., 6 or 9 in. over the feet measurements it would be as well to obtain tiles 6 in. square and some half tiles—i.e., 3×6 in.—as these can be put down in rows, as indicated in Fig. 2A without a lot of extra cutting to odd sizes.

When obtained, the tiles should be placed in water and left to soak until required for use.

Preparing Floor.—Apart from making the existing concrete surface rough to give the new work a grip, it is essential that it shall be level when finished, and if the area is of fair size it may not be easy to float large sections of the space with cement and keep it level. In any case, the tiles can only be put down in sections while the operator occupies part of the floor to kneel on.

A start should be made on the far side where no one will have to step in order to get to the sink or back door. For all cement mixing should be done outside on a board, and water will be required during the work.

The surface of the concrete can be roughened by means of a cold chisel and hammer. Sweep up all dust and chips and make one length of floor space wet, sufficient to take, say, four rows of tiles. Mix up enough cement to float over this space only, and to ensure a level foundation place a long strip of wood by the wall and another some distance out. If an inch thickness of cement is needed, then the wood should be 1 in. thick. Test these strips as they lay by means of a spirit level and, where necessary, insert a little packing under them to correct the level. A straight-edge board is required just long enough to span the two strips, Fig. 2B.

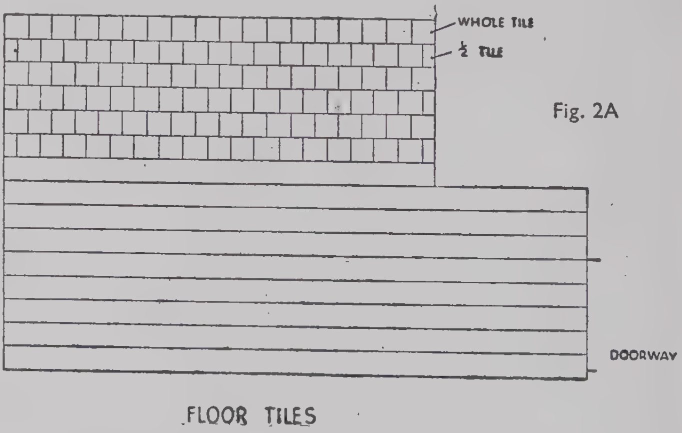


Fig. 2A

Spread the cement over the floor between the two wooden strips and level off as near as possible with a trowel. The straight-edge float is placed against the wall at the far end, held down on the wood strips and given a backwards and forwards motion. At the same time, advance it to move the surplus cement forward to fill the hollows, leaving a level surface behind.

Unless the tiles are arranged in regular fashion, they will look unsightly. Where a row is started with a whole tile, the next row must start with a half tile, as shown in Fig. 2A. Thus the joints in one row do not come in line with those in the next.

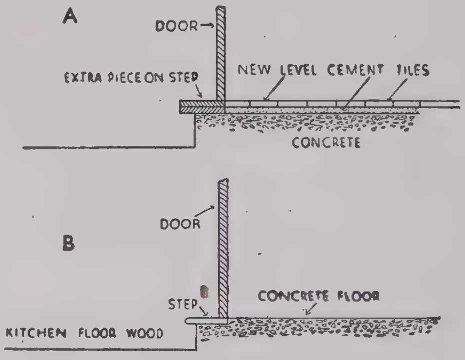


Fig. 1

Before the tiles can be placed, the wood strips are removed and the hollow spaces left carefully filled in with cement to the surrounding level.

The damp tiles are then placed in position one by one and each given a tap with the handle of the trowel to bed them firmly. Having completed one section, the next strip is prepared with the levelling strips in the same manner, care being taken to see that the edge of the new section is blended, and level, with the previous work.

Wall Tiles.—If a brick wall is to be covered, first rake out all the joints in the brickwork and give the wall a coating of cement made of one part of sand to one part of cement. After smoothing this, brush it lightly with a stiff brush to form a key for the cement used to fix the tiles. Neat cement is required for this. Half tiles should be used to start alternate rows, as for the floor work.

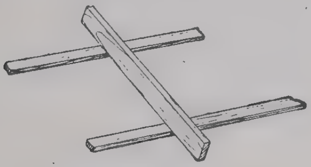
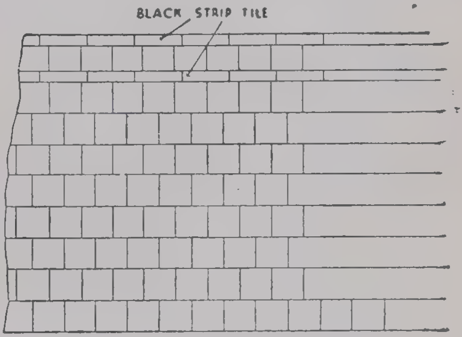


Fig. 2B

Towards the top, the plain effect may be broken by using tile strips as shown in Fig. 3 in some contrasting colour to match the paintwork.

The straight-edge is also used from time to time to check the surface to see that there is no bulge in any part.

The surface of new tiles is often unsightly, having a white stain which cannot be removed by scrubbing. The usual treatment is to rub over well with linseed oil several times at intervals of a few days and to follow this with a good rubbing with a special kind of dark red floor polish for tiles. This polish will soon clear the whiteness and should be used with the same frequency as ordinary floor polish.



WALL TILES

Fig. 3

HOW TO FIT A MODERN WASH BASIN

THE illustration appearing in Fig. 1 depicts a modern hand basin with chromium-plated taps, white porcelained brackets, chain and plug and an outlet cleaning trap, the cost of which would not be excessive, while the cost of the piping and pipe fittings will depend on the length of the runs which, from the economic as well as the practical point of view, should be kept as short as possible.

A grade of iron pipe known as steam barrel must be used for conveying the hot water, a thick lead pipe for the cold supply and a lead pipe for the waste.

Running the Pipes.—The diagram shown in Fig. 2 shows a method of connecting up the pipes. It will be seen that the new hot-water pipe is connected to the expansion pipe just above the hot-water cylinder; the pipe feeding the cold-water tap is joined to the cold-water supply main. The waste pipe is run under the floor-boards and discharges into the nearest hopper. This pipe should have a slight fall and be carried along or across the joists without sag, so that no water is allowed to remain in the pipe.

If the room to be fitted adjoins the

bathroom, the various connections can be made to pipes in that room.

Fix the brackets to the wall. The height of the top edge of the basin when fixed should not exceed about 3 ft., and care must be taken that the brackets are level both horizontally and vertically.

Plugging a Wall.—If the wall is of brick, plug it with long wooden fixings, taking care when making the plug holes not to hammer too vigorously or you may damage the wall, especially if it is one brick thick. The secret of success in plugging a wall is to use a small sharp cold chisel and to give the latter a number of light blows rather than a smaller number of heavy ones. Cut and remove the plaster where the hole is to be as this will prevent the plaster being damaged outside that area.

If the wall is of lath and plaster, it may be necessary to fix a couple of horizontal battens across at the back and secure them at the ends by stout screws driven into the vertical studs, as indicated in Fig. 3.

It will now be necessary to take up a few floor-boards to conceal the pipes and to measure up the run to ascertain the lengths of the pipes and fittings required. Do not under estimate the amount of pipe required, but add on at least a foot to each length.

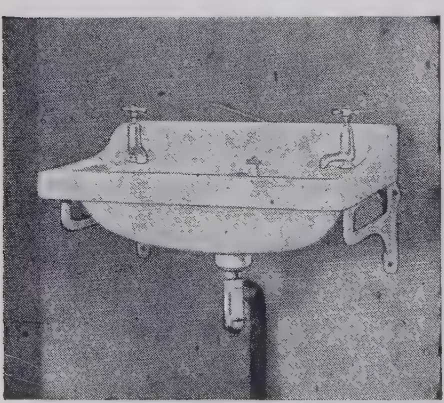


Fig. 1

When ordering the material you should also hire a pipe vice and a stock and die of a diameter to suit the external diameter of the steam barrel. A hack saw and pipe grips will also be needed.

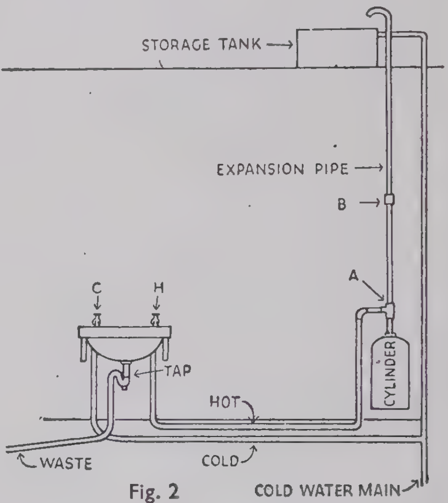


Fig. 2

Start the pipework by installing the hot-water service. The first thing to do is to cut off the hot-water supply either by turning off the cock generally to be found near the cold-water cistern in the loft space under the roof or by plugging the outlet orifice with a wooden plug. Then drain the pipes by turning on the hot-water taps. There is no need to cut off the cold water at this stage, but no fire must be lit under the boiler.

Joining Pipes.—With a hack saw or pipe cutter, sever the expansion pipe at a distance of about 9 in. above the top of the cylinder as a tee-piece is to be inserted here for joining the new pipe. Remove the longer piece of pipe by unscrewing it at the nearest joint, and then unscrew the shorter piece. Cut a thread on the severed end of the 9 in. length and screw on a tee-piece, as at A in Fig. 2.

To make the joints in the screwed barrel water-tight, apply a mixture of white and red lead, linseed oil and turpentine to the screwed threads. This compound should be of the consistency of thick cream and painted on with a brush. It is also necessary to wind on a few strands of hemp previously treated with the paint, round the bottom of the threads to ensure a permanent water-tight joint when screwed up.

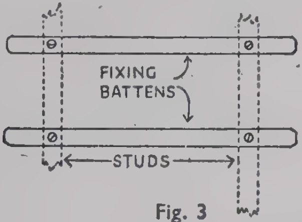


Fig. 3

At the upper end of the tee, screw in a short connecting piece or nipple and then reinsert the upper end of the longer pipe into its fitting, B in Fig. 2, to ascertain how much metal must be removed at the opposite end. Mark the pipe, remove it and saw off the waste. Cut a thread equal in length to that of a connector, plus the thickness of a lock nut, run these fittings on the thread, lock nut first, connector last, and screw the pipe in position at the top, not forgetting to apply the paint and hemp. Screw the connector over the nipple and then tighten the lock nut, again using paint and hemp at the bottom of the threads. Details of the connection are shown in Fig. 4. Fit the rest of the water pipe and then connect the end to the tap.

Now install the cold water and the waste pipes. Get a plumber to make the connection unless you know how to make wiped joints in lead pipes, a process demanding great skill. This operation will, of course, necessitate shutting off the cold-water supply at the main and draining the pipes by opening the taps.

Waste Discharge.—If the hopper into which the waste pipe is to discharge is some distance away, do not run the pipe outside the wall of the house as frost is likely to block the pipe. Run it underneath the floor-boards as far as possible and keep the length of pipe outside as short as you can. When the connections have been made, the water may be turned on and the basin put into service.

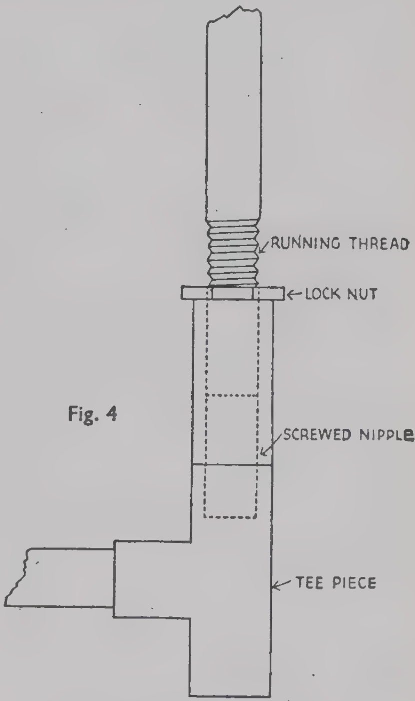


Fig. 4

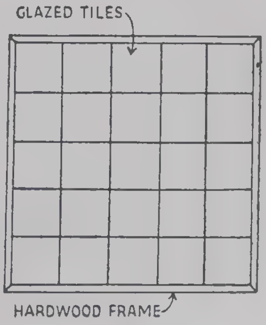


Fig. 5

If desirable, the space below the basin could be enclosed to form a cupboard for toilet requisites.

The wall at the back of the basin is

likely to get splashed with water, so it is desirable to make a splash-back. This could consist of a wooden mitred frame housing a number of white or coloured tiles, each measuring 6 in. square. The frame should be about 2 ft. high and a trifle wider than the width of the basin fitment. The tiles can be glued to ¼ in. thick plywood backing, the joints filled in with thin plaster-of-paris and then inserted and fixed into the rebate of the frame. The frame shown in Fig. 5 is neatly fixed to the wall by means of brass back plates.

FITTING A CUPBOARD UNDER THE STAIRS

Many small houses are designed with an open recess underneath the staircase. In such cases the appearance of the hall will be enhanced by enclosing the space, thus providing a cupboard for accommodating coats, hats and articles such as the vacuum cleaner.

Fig. 1 shows a typical example. Although measurements will vary in different cases, the general layout will remain the same.

The tools required are a hand saw, small plane, hammer, screwdriver, rule, and a rawlplug tool for plugging the wall.

The upright A, forming the door post, is of 2 in. square deal as is the short one B at the opposite end. The post measures 6 ft. 9 in. and the bottom is cut away to clear the skirting, as shown, while the top is cut to suit the angle between the wall and ceiling of the space. The same applies to the top of the shorter post.

Although these posts are hidden from sight, it is a matter of minutes to skim the wood with a plane and so give the job a finish.

General Details. — The wall to which the door part is to be fixed will often be of brick. To obtain a firm fixing it will be necessary to plug the wall. If this is the case, find a mortar joint in preference to boring bricks. Make the top fixing not less than a foot from ceiling, a corresponding one at the same distance from the other end and another midway between the two. Use No. 12 countersunk-headed iron screws 4 in. in length.

The small upright B may be screwed direct to the edge of the wide wooden upright of the staircase indicated at C.

Matchboarding ½ in. thick (finished) is used for enclosing the space. Therefore, the top batten should be fixed ½ in. back from the face of the string, as the outside sloping part of the staircase is called, to enable the faces of the boards to lie flush with that member.

The undersides of the stairs will in all probability be covered with laths and plaster to form the ceiling so it will be necessary to find a solid fixing. This can be done by inserting a blade of a bradawl into the ceiling to find the positions of cross members.

The position of the fixings on the ceiling, half a dozen will do, should be marked and the top batten D cut to length and placed up to the marks. The batten can then be marked for the screw holes. Screws, 2 in. in length and of No. 10 gauge, will suffice for fixing the batten.

If the floor is of wood the lower batten E is simply screwed directly down on it; but in the case of a tiled floor, plugs must be inserted for fixing.

The rawlplug tool is as suitable for making holes in tiles as it is in brickwork. A number of gentle taps on the top of the tool are better than a few heavy ones, and if these instructions are carried out there is little risk of breaking the tiles

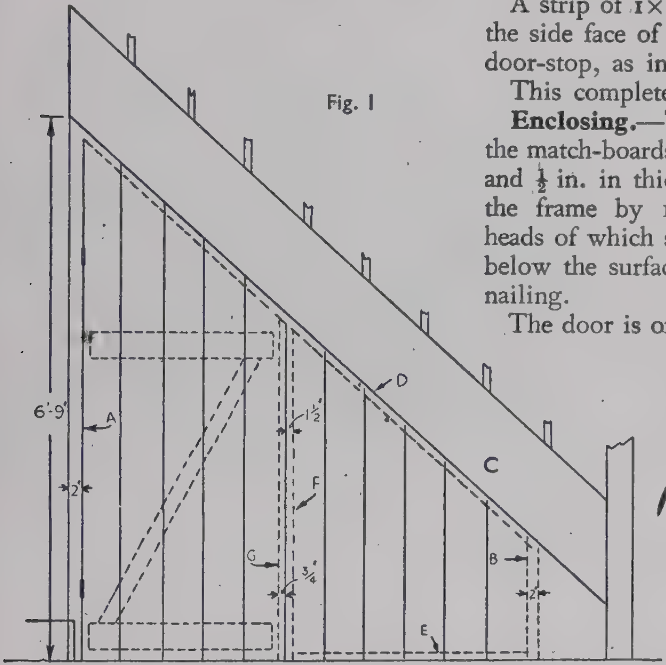


Fig. 1

There remains the task of fixing the upright forming the short door post F. This piece is of 1½ in. square stuff, skimmed with a plane, sawn at the top and to suit the slope and fixed by driving in nails on the skew.

It is important that the post be quite parallel to its fellow member A in order to obtain a good fit for the door.

A strip of 1 × ¾ in. wood is nailed to the side face of the upright to act as a door-stop, as indicated at G.

This completes the framework.

Enclosing.—The next item is to fix the match-boards. These are 5 in. wide and ½ in. in thickness, and fastened to the frame by 1½ in. oval brads, the heads of which should be punched just below the surface after completing the nailing.

The door is of the same material and is held together by two ledges 4 in. wide × ¾ in. thick. To prevent the door from sagging, a brace, or diagonal piece of 2 × ¾ in. stuff, is fixed between the ledges, as shown.

A pair of 16 in. tee-hinges should be used for hanging the door and a small metal latch fitted to the opposite side.

Knots appearing on the surface of the cupboard should be treated with knotting preparatory to applying a primary coat of lead paint after which the nail holes may be stopped with putty.

Two coats of undercoating should be applied of a colour to suit the finishing coat. The final coat should, of course, match the paintwork of the staircase.

MIXING AND PREPARING PAINTS

Paints prepared and mixed at home from dry or wet pigments can be made in any desired colour and waste is avoided by making the exact quantity needed. Disadvantages are the trouble which has to be taken and the risk of wrong quantities spoiling the quality.

Care will obviate such risks.

Materials and appliances must be kept ready for the job. A number of cans are required, some quart bottles, a square of thick glass, several metal rods, sticks of non-resinous wood, an old table knife, and two or three earthenware vessels, as indicated in Fig. 1.

The use of dry or wet pigment is dictated by the colour used and the quantity required. For a large quantity of paint of normal colour, pigment in paste form should be purchased, as it is cheaper. A little dry pigment can be kept in stock in case a very small quantity is required, but for colours such as ultramarine, chrome yellow and vermilion, dry pigment only should be used and this in very small quantities. These colours are very expensive and are very powerful stainers, so that only very small amounts are required.

Dry Mixing.—Dry pigment should be placed upon the glass square and a little pure linseed oil added. Then grind the pigment into the oil with the knife, using a circular motion and considerable pressure as illustrated in Fig. 2. The pigment should be ground, adding oil as required, until a sticky but smooth paste is formed. The procedure then becomes the same as for paste pigments.

Mix the paste with raw linseed oil and turpentine, the proportion of linseed oil being about three times that of the turpentine, and copal oak varnish. If glossy paint is required, more varnish must be used. The method used in mixing is to stir the paste well into the different oils, adding each gradually and stirring with a metal rod. The mixing should be done in a clean can, and each oil should be mixed until no hint of streakiness remains. The process is shown in Fig. 3.

The paint is finished off with patent dryers and turpentine added to thin to the desired consistency. If the paint is not to be used at once, it should be sealed down in the can with a piece of wax paper under the lid. This will prevent the formation of scum.

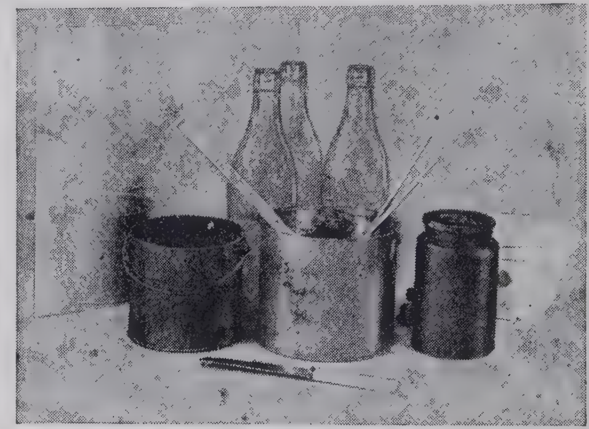


Fig. 1

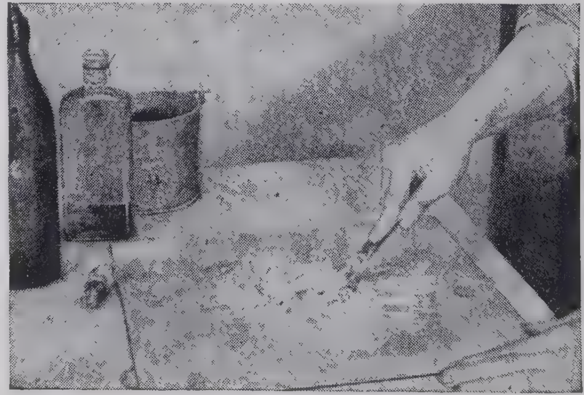


Fig. 2

Mixing to Colour.—Mixing paints to various colours requires care and a knowledge of the colours being worked. For instance, white paint, either lead-white or zinc, has a yellowish tinge.

Therefore, to all white paints, a very small quantity of prussian or cobalt blue should be added, stirring in slowly and cautiously. This will make the paint an intense white.

An aid to mixing colours is a chart giving the different orders of colours and how they are formed, which can usually be obtained from a text book on art or physics.

Fig. 3

When mixing paint for a two-coat job, the colour should be divided into two parts. Turpentine, with a little carbonate of lead, should be added to the part used as a first coat. The other portion should be varnished and linseed oil dryers included for a second coat.

When mixing colours, make enough for the job, as it is very difficult, unless a formula is kept, to make the exact colour again. If a big job is being done, and the quantity of paint required uncertain, it is best to have on hand two clear glass jars with wide mouths, one large and the other small. These jars are both graduated with inch marks as illustrated in Fig. 4, enamelled or etched with hydrofluoric acid. The basic paint (usually white) is measured off in the large jar, and a rough measure jotted down. The added colours are measured in the smaller jar, and notes made of each addition. It will then be possible to repeat the colour exactly.

Popular Colours.—The following are quantities for useful colours:

Lead-white: 7 lb. white lead, ½ lb. dryers, 1 quart raw linseed oil, 1 pint turpentine, 1 pint copal oak varnish. Mix the white lead and dryers first.

Zinc-white: six parts zinc-oxide ground in oil, four parts raw boiled oil, two parts turpentine, ½ oz. liquid dryers to each 1 lb. mixture. For use at the seaside, add small part carbonate of lead (poisonous).

Green: add brunswick green to zinc-white. Mix a small portion first on glass, testing tint and noting proportions as directed. Pea green: fifty parts white, one part green. To remedy blue tone, use a little chrome yellow ground in oil. Four parts copal oak varnish one and a half parts turpentine, 1 oz. patent dryers to every 2 lb.

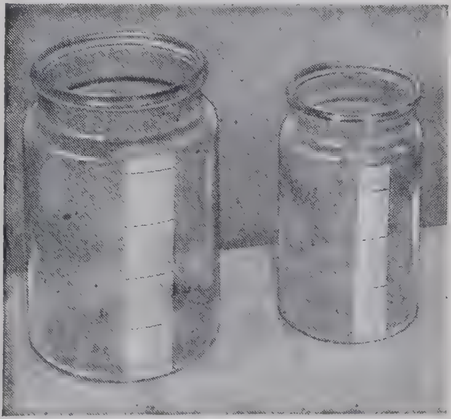


Fig. 4

Stone: mix white-lead paste with two parts copal oak varnish, three parts raw linseed oil, one part turpentine. Stain with equal parts yellow ochre and burnt umber in oil. Use ½ oz. dryers to every 1 lb.

Heliotrope: two parts zinc-white, three parts red, four parts ultramarine blue.

Flat paint can be made by adding to white-lead paste 1 oz. dryers for every 1 lb., one part raw linseed oil and five parts turpentine. It is better to purchase metallic paints such as silver, gold and aluminium. Mix each colour thoroughly before the next is added. Use metal rods for mixing and wooden rods for stirring the paints during use. Never mix in a dirty can.

PRACTICAL HINTS ON PAINTING AND VARNISHING

A SURFACE to be painted should be free from all foreign matter. If it has been painted before, it should be stripped and cleaned.

Soda water is best for cleaning new or previously-painted surfaces. Prepare several buckets of soda water before beginning work on a big job. The prepared solution can be warmed up as required. White rags should also be ready for applying the soda water and for wiping off and drying.

Preparing Walls.—Even a new plaster wall should be washed off with soda before distempering. If old paint or distemper is not stripped off, it is essential to wash it with a strong solution. The soda water should be washed off before painting is commenced.

Furniture, carpets and floors should be covered with newspaper, for paint splashes in spite of every care. Rags should be kept ready to wipe fingers and brush.

Two single gadgets will be found of great help; one prevents the hands becoming soiled through the handle of the brush being covered with paint and the other stops the paint spilling down the can. For the brush, cut a piece of linoleum about 6 in. long, tapering in width from 3 to 1 in. Wrap it round the brush handle, starting with the 1 in. end to form a cup below the bristles to take all surplus paint, and held on with a piece of twisted wire, as in Fig. 1.

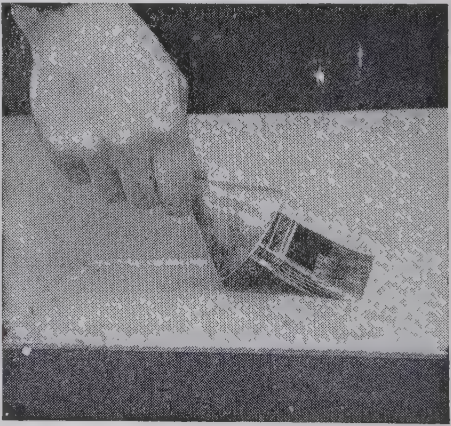


Fig. 1

To prevent paint spilling down the can, cut a piece of tinplate in the form of an oblong, with a square section cut out near one end. The other end of the tinplate is bent over the rim of the can so that the piece with the hole in it projects into the can. The paint brush is then wiped on the edge of this hole, as seen in Fig. 2, after being dipped in the paint, instead of on the side of the can.

Keep an old and worn distemper brush by you to brush down walls.

When painting moulded work, as shown in Fig. 3, have a variety of brushes of different sizes to fit the mouldings, and brush corners thoroughly before leaving to dry. Be careful to brush off excess paint which otherwise may form into beads and ridges.

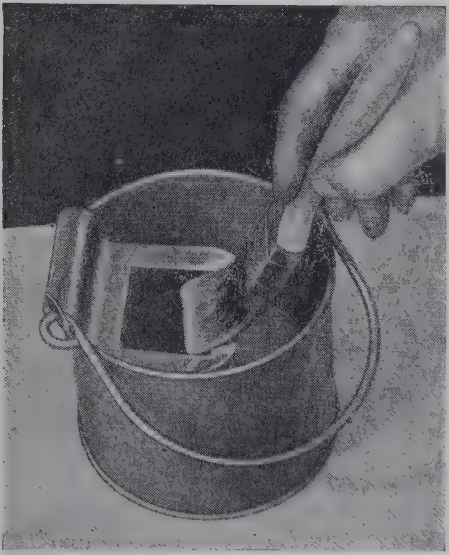


Fig. 2

Blow-lamp and Scraper.—When a surface has been cleaned of paint by burning with a blow-lamp, rub it down with pumice-stone and turpentine. Never keep the blow-lamp on one spot longer than necessary to melt the paint, as there is a great danger of burning the wood. Always keep the scraper clean and dip it in paraffin frequently while working, as shown in Fig. 4. Keep the scraper pressed nearly flat against the surface, as a wide angle may lead to dents or notches.

When repainting articles from which old paint has not been stripped, give two undercoatings.

Knots in new wood, or in old wood that has been stripped, should be treated. Shellac knotting should be used over and around the knots as shown in Fig. 5. Two coats for new wood, one for old. Shellac varnish, to which a little spirit has been added, gives good results if knotting preparation is not available.

Work is often spoiled because each coat of paint is not allowed to harden before a fresh one is applied. Blistering and flaking off result if this precaution is not taken. At least twenty-four hours should be allowed for a coat of ordinary oil-bound paint to dry.

Varnishing.—Amber varnish is the best for general use. It can be prepared in the following way. Take a hard glass flask and put in 2⅛ oz. of pulverised amber chips. Heat over a burner. When melted, add ¼ pint of artists' linseed oil, which has previously been heated to the same temperature in another vessel. Pour slowly on to the melted amber, stirring all the time with a clean hardwood stick. Let the mixture simmer until stringy and then pour in slowly ¼ pint of turpentine, also heated. Stir all the time. The colouring may alter through variation of heat or stirring.

If varnish fails to dry on a polished surface, clean off all traces of it with acid or spirit, and rub the surface with pumice powder, or powdered bathbrick and water. Wash thoroughly, brush, and varnish again.

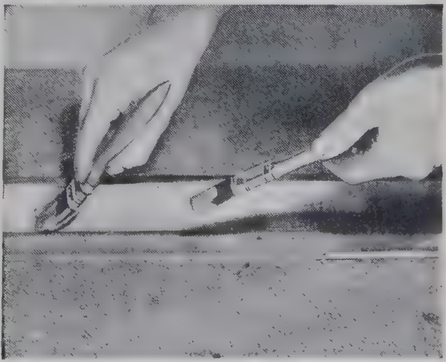


Fig. 3

Dark patches which appear on varnished doors should be treated with weak oxalic acid, applied to the patches only, and washed afterwards with diluted vinegar.

Paint and varnish brushes should be kept clean when not in use. Clean them with soft soap, warm water and paraffin after use, and leave to soak in petrol or paraffin. To remove excess petrol or paraffin when using again, brush a clean flat board as shown in Fig. 6 until no mark is left.

Varnishing in cold weather is often difficult because the material becomes stiff. A small quantity of heated linseed oil poured in before use is a good preventative. It is also advisable slightly to heat the varnish.

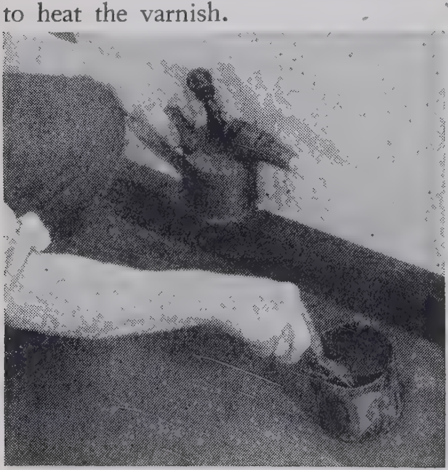


Fig. 4

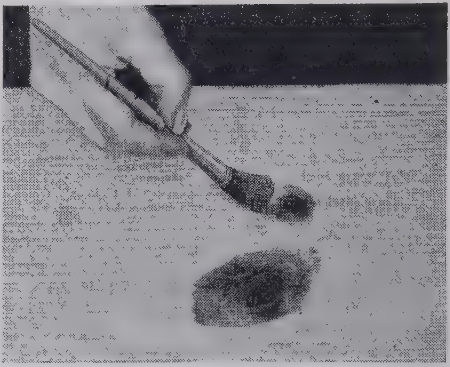


Fig. 5

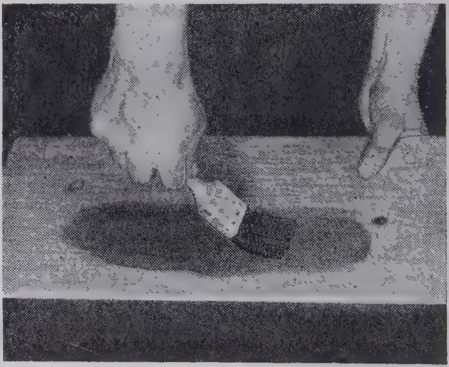


Fig. 6

More dryers should be incorporated in paint during winter than in summer.

To remove the smell of paint, place in the room two bucketsful of water, each containing 2 oz. of vitriolic acid. In country districts, a bucket of hay standing near new work is good for removing the smell.

ENAMELLING FURNITURE AT HOME

The use of enamel for some furniture is recommended as this paint provides a finish which is durable and easily cleaned.

Preparing the Surface.—Great care should be taken in the preparation of the surface. The article, if enamelled before, should be cleaned of old paint with a dissolving solution. It is then necessary to rub well with pumice-stone and water, and coarse glass-paper and finish off with a finer grade.

If the article is new, grease, dirt and stains must be removed with warm soda water applied on a leather or soft cloth. One part soda to three of water should be used and the surface washed thoroughly. The article must be dried.

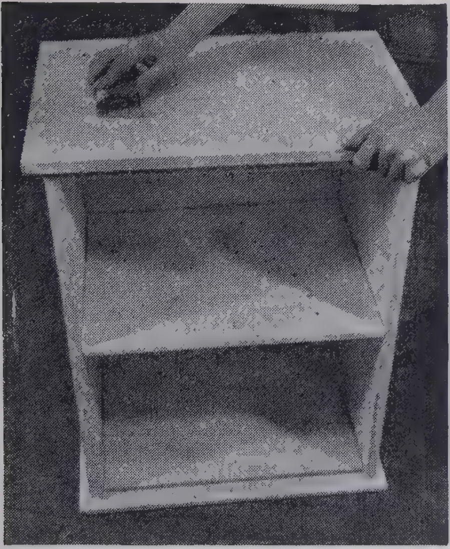


Fig. 1

Stop knots with patent knotting and then give the article a rub down with No. 0 glass-paper. Where dirt is ingrained, rub lightly with coarse glass-paper and then with fine. Wrap the glass-paper round a block of wood or cork and apply it in the direction of the grain, as shown in Fig. 1.

Both new, unfinished surfaces, and those from which old paint has been removed must then be brushed with a soft, wide brush, as in Fig. 2, to take away all dust left from the glass-papering.

Undercoats.—Although it is best to buy branded enamels, which are skillfully made to exact proportions, the primary coating can be prepared at home. This consists of zinc-white ground in turpentine, with a quantity of pale oak varnish added. Four parts white, one part turpentine and one part varnish is a good mixture, although on old furniture it is better to use more varnish.

The primary coat is applied with a soft, wide brush as quickly as possible and left to dry thoroughly. It is then rubbed down with fine glass-paper until very smooth. Use the finest obtainable, as the surface should not be noticeably scratched at all. Then brush the surface again and apply the enamel.

A camel-hair brush of 1 in. width should be used and it must be clean. A new brush is not a necessity. A brush which has been broken in on other work and thoroughly cleaned will give the best results. New brushes must be cleaned in water and dried before use.

Only one coat of enamel should be needed over the primary coat. The brush should be worked downwards and then across at right-angles to eliminate brush marks as much as possible. Speed is essential, as enamel begins to set quickly and, after a few minutes, will show brush marks badly. Always work one way and, if possible, use only two or three strokes to cover the surface.

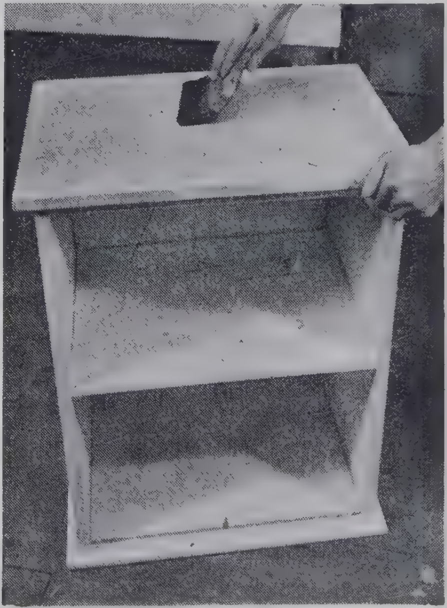


Fig. 2

When enamelling articles which are beaded, or in corner or recess, care must be taken to prevent the formation of beads of enamel. For these parts, use a brush which will fit well in; do not use too much enamel and do not dab. When wiping an enamel brush on the side of the tin after dipping, wipe the tip of the bristles with a sideways motion, and not on the flat of the brush.

A Good Filler.—It is sometimes necessary to use a filler when re-enamelling old work. The filler is used to raise indentations, to fill the cracks and to give a smooth surface for the final coat. Good commercial fillers are obtainable or a home-made filler can be prepared as follows. Take equal parts of paste of white-lead, finely powdered whiting, and mix to a stiff cream with japanner's gold size. Strain through fine canvas. The filler can be put on with a putty knife or a stiff brush.

To obtain a clean surface, lightly dip a putty knife in turpentine and press gently against the filler just before it sets.

After using the filler, rub down with glass-paper and give another coat of flat white for enamel backing.

Articles should never be enamelled in either a cold or a hot room. An even reading of about 70 deg. F. is the best. Never dry enamelled articles in a current of hot air or with heat. This hardens the surface, leaving the underneath liquid and will produce cracks.

White enamel can be made as follows: For each gallon of enamel required, take 4 lb. zinc oxide. The oxide should be ground into a mixture of very pale copal varnish (three parts), dammer varnish two parts, and french oil varnish one part, adding a little dry blue as required. The furniture may also be given a matt finish by dulling the enamel with pumice powder applied with a soft cloth after the final coat has dried. The powder can be applied in parts only to produce a varied effect.

MODERNISING THE KITCHEN

To bring an old-fashioned kitchen up to date, new appliances should take the place of obsolete ones. The old range should be replaced by a modern stove burning coke, I in Fig. 1. These stoves take up less space than the range and are much more economical.

They are made with a vitreous enamel surface and do away with the black-leading and polishing which constituted a tedious labour with the older kinds. Enamel surfaces and chromium plating are kept clean by wiping and will stay clean without labour.

Kitchens differ so much in shape and in size that not one example will serve for all; but Fig. 1 shows a lay-out for a kitchen of a shape often found. The sink A should be near the window, as shown in Fig. 2 to get good light and efficient ventilation.

A sink in a dark corner means undiscovered dirt and grease. The modern sink is of glazed earthenware and should be of fair size and have a clear space below it, while a draining board B should be made removable for scouring.

Soft Water Economy.—Near the sink should be a water softener, C. This is connected to the cold water tap by a rubber hose and an instantaneous coupling. The spout of the water softener should project over the sink. Cooking utensils and kettles are thus freed from fur deposit so that less fuel is used to boil the water, the saving being as much as 50 per cent. Soft water also requires much less soap for all washing purposes.

The old copper should be removed and

replaced by a portable gas-fired boiler D which can be stored in a corner when not in use. A useful type is shown in Fig. 3. Where electricity is laid on, an electric washer and ironer E which combines a washing machine to take the place of the boiler, and a rubber roller wringer and roller ironer in one unit, will take the places of the copper, mangle and wringer and occupy little space in a corner. It enormously reduces the time of the weekly wash and is one of the most efficient of labour-saving appliances.

Modern Dressers.—The old-fashioned open type of kitchen dresser should be discarded and one of the new kitchen cabinets F put in its place. The inside shelves are enamelled, the pull-out table G is covered with a white enamelled metal sheet sliding, when not in use, between the bottom cupboards and the top glass or wood doors which enclose the shelves. It is shown (dotted) open.

The gas or electric cooker H should be placed as near as possible to the cabinet, in good light and away from draughts which interfere with heat efficiency and may be dangerous in the case of a gas cooker.

Wallpapers should be avoided. The walls should be sized and painted, and the colour should be pale so as to get as much light as possible in corners farthest from the window. The ceiling should be white, preferably painted.

Doors and windows should be enamelled. It costs more than ordinary paint, but lasts much longer and can be wiped clean with a damp cloth.

The floor should be kept clear so that it can be easily swept with a broom in every corner. Thick plain linoleum is the best covering

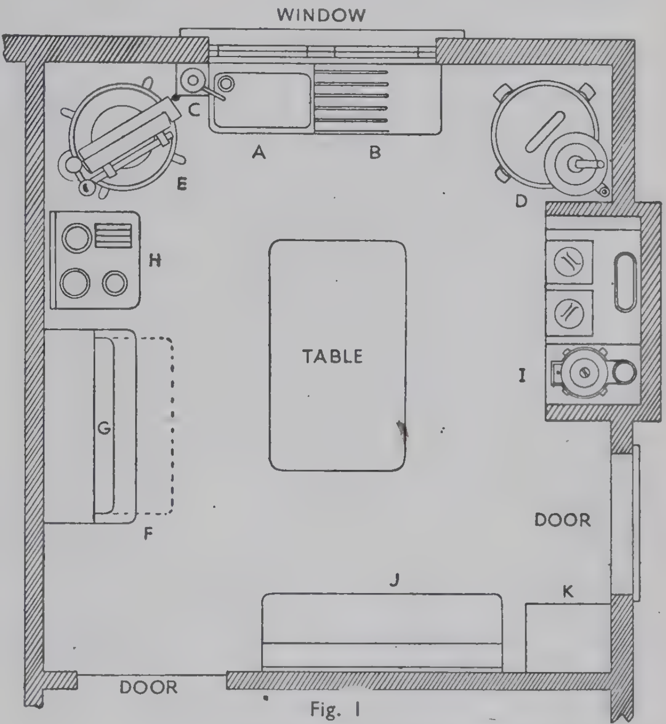


Fig. 1

Electricity.—Lighting of the kitchen must be good. The best light is a reflected light from a central bulb with an opal globe of large diameter below it, so arranged that the light is thrown all over the ceiling and for a foot along the walls each side. With such lighting there will be no shadows.

Wall plugs, in a house supplied with electricity, should be fitted in the kitchen for such things as irons or an electric toaster, and separate plugs, with earthing plugs attached, should be provided for the electric washer and ironer which should have a separate circuit directly wired via a special fuse-box from the main switch and terminal board.

Shelves are a necessity for spare crockery and household utensils, but they should be enclosed in shallow cupboards with doors. Plate racks should be fitted so that plates are instantly available without taking them from piles. The usual closed type of dresser (J) is suitable but should be narrow.

Where possible, the corners of walls and skirtings should be rounded and the latter should not have dust retaining mouldings. The lower part of the wall, to a height at least 4 ft., should be of a darker colour than the rest and should be marked off by a band of contrasting colour as a finish. The kitchen door should have finger plates. This is more important in a kitchen than in the living rooms.

Where the sink is in the kitchen, the wall surrounding the sink should be lined with tiles with a moulding surround of the same material. These should be white or light coloured to tone with the walls.

Clean Cookery.—If the cooker is in a corner, it should be of a size which will allow a brush to be used on the walls and floor all round it to allow grease to be easily removed. It should be surrounded by enamelled iron plates fastened to the wall and extending from the top of the skirting to at least 18 in. above the top grid of the stove. This should be done even if the cooker has an overhead plate rack with an enamelled back.

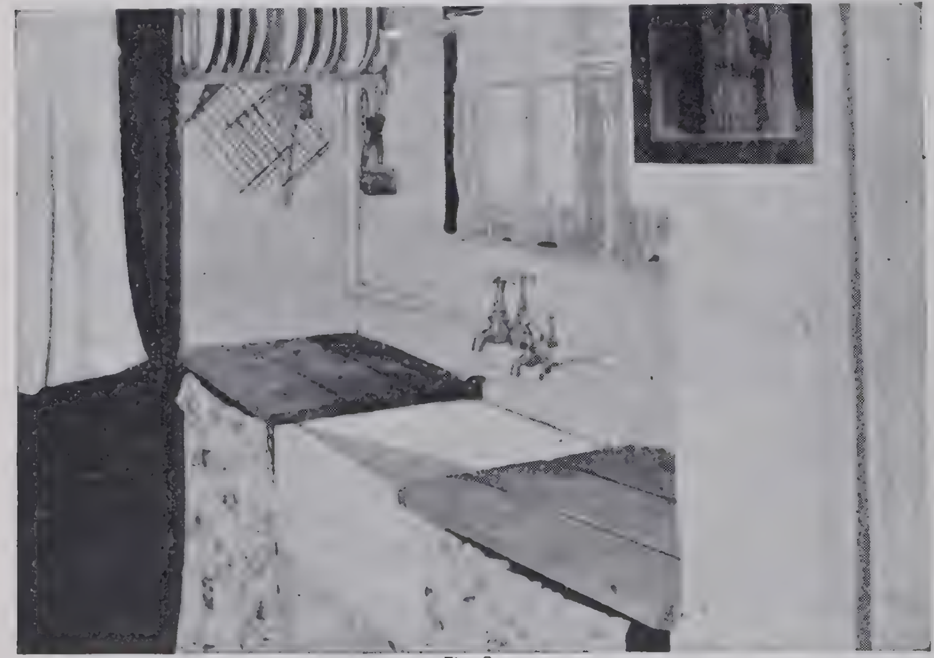


Fig. 2

Ample ventilation should be provided. A hinged fanlight should be fitted above the outside door and if the cooker must be arranged alongside the chimney-breast, a hood with a fume pipe at least 6 in. in diameter should be taken from the hood into the chimney to carry off the cooking fumes. A great preventative of cooking odours reaching the rest of the house is to fit a pneumatic or hydraulic door-spring to the inside door so that it will always close behind anyone leaving the kitchen.

A handsome piece of kitchen furniture is a two tiered dumb waiter on rubber tyred castor wheels as illustrated in Fig. 4. It makes for speed and neatness in serving and removing meals. It should have a place reserved for it against the wall in an unoccupied corner.

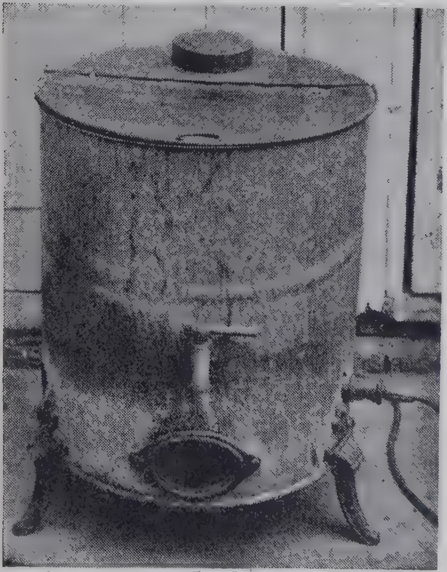


Fig. 3

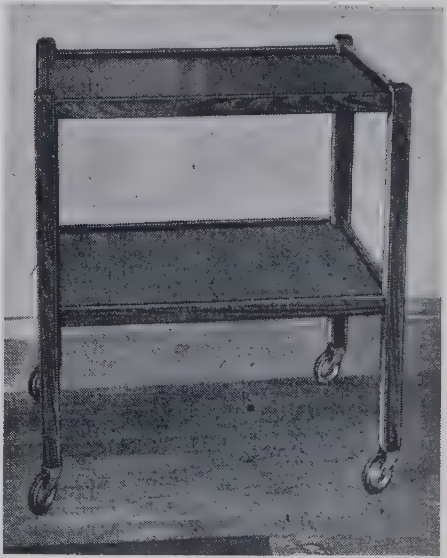


Fig. 4

Brushes and cleaning apparatus should be kept out of sight, and a rack in a shallow cupboard (K) about 5 ft. high and 8 in. deep should be provided so that soft and hard brooms can be hung head upwards to prevent bending of the bristles. Such a cupboard could hold underneath, boot and stove cleaning tackle and the housemaid's box. It might also accommodate coal scuttles.

MAKING A SERVING HATCH BETWEEN THE DINING ROOM AND KITCHEN

WHERE the dining-room adjoins the kitchen, meals may be prepared and served more easily and quickly if a serving hatch is made in the dividing wall, illustrated in Figs. 1 and 2. These show the hatch viewed from the kitchen and dining-room respectively.

The partition wall, being on the ground floor and perhaps near a fireplace on the kitchen side, is likely to be of brickwork at least 4½ in. thick. Some partitions may be of coke breeze blocks about 4 in. thick. The cutting of the opening and the making and fitting of the timber framework shown in Fig. 3 will be practically the same for either.

Wall Construction.—Walls dividing the upper floor rooms may be of lighter construction, such as lath and plaster on a timber framework, with or without bracing members. This construction is therefore to be expected in a large house converted into flats.

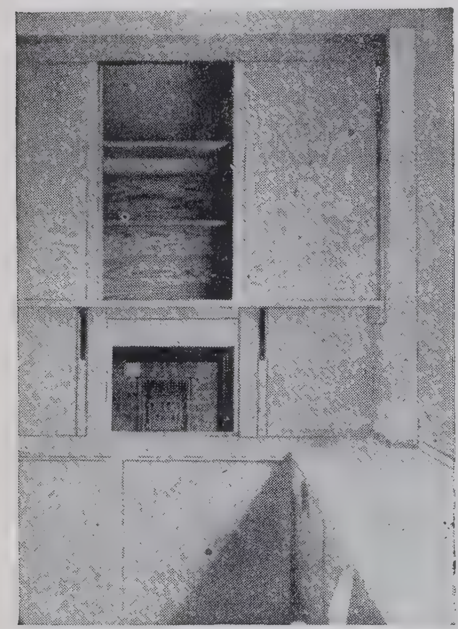


Fig. 1

The room diagram shown in Fig. 4 shows the convenience of making the hatch, and is characteristic of many cases. A cooker and hot-water boiler are installed near the table, sink and the hatch through which meals are to be passed. An opening measuring about 2 ft. 3 in. high and a couple of feet wide will be wide enough to take a large tray.

The kitchen side of the hatch is fitted with a cupboard, the top of which forms a table. This cupboard could be substituted by a drop-flap table, which, when not in use, is let down and the supporting brackets folded back behind.

Flap Tables.—A drop-flap table in hardwood similar to that suggested for the kitchen could be fixed directly under the hatch, or a low sideboard could be placed there, the top to come just below the sill of the hatch. In the latter case, moulding to match the sideboard should be used round the opening.

If a drop-flap table is used, the top should be about 3 ft. from the floor, and as the sill to which the shelf part of the hatch is fitted is 2 in. thick it will be necessary to mark the wall 2 ft. 9 in. up from the floor for the bottom of the sill.

The lintel over the top of the opening is 3 in. thick, and the top edge of this, 2 ft. 7 in. above the 2 ft. 9 in. mark, or 5 ft. 4 in. from the floor.

The opening in the brickwork should be a trifle over 2 ft. 5 in. wide and 2 ft. 7 in. high, with recesses cut back at each end 2¼ in. deep into the wall to house the ends of the lintel and sill, as indicated in Fig. 3.

The frame members, Fig. 3, should be prepared ready for fixing. The overall size of this is 2 ft. 5 in. wide × 2 ft. 2 in. high, made of yellow deal 5¼ in. wide, which is the approximate thickness of the wall, plus the plaster on each side. The ends of the horizontal members of this frame should be trenched or grooved to house the grooved ends of the vertical pieces. The grooves should be ½ in.

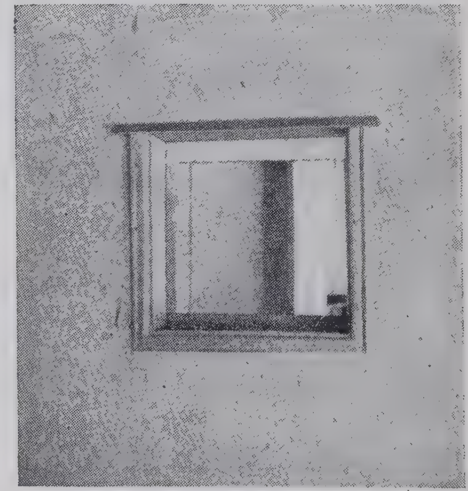


Fig. 2

deep and ½ in. wide and the tongues on the side members of the same size.

When the brickwork has been cut away, the lintel should be fixed first to take the weight of the walling.

Cutting the Opening. — Measure and mark out the full size of the aperture and remove the bricks with a hammer and sharp cold chisel.

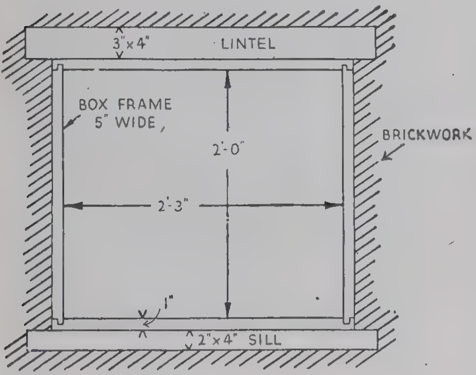


Fig. 3

Cut the lintel, which need not be planed, to length, and fit the ends into the recesses in the brickwork. Do the same with the rough sill.

Now fix the box lining. This is fastened to the lintel and sill with 2½ in. No. 10 wood screws, countersunk below the surface.

As it is unlikely that the box will fit exactly between lintel and sill, thin strips of wood should be inserted between these members to make a tight fit. To keep the box lining square, it is advisable temporarily to brace the corners with thin diagonal battens.

If the edges of the fitment project beyond the surrounding plaster, the amount of projection should be marked, the box removed and planed down to the marks.

Damage to Brickwork.—Any gaps between the sides and brickwork should now be filled in with portland cement mortar in the proportion of three of sand to one of cement. Fill the space so that it is within ¾ in. of the face of the plaster. Damp the bricks before applying the mortar. Now nail a couple of thin strips of wood along the outside faces of the lintel and sill to form a key for the new plaster and then mix sufficient Keene's cement for facing purposes. Before applying the plaster, moisten the surrounding plaster, mortar and woodwork.

The Door. — There are several methods of fitting the door. One is to hinge it from the kitchen side so that the door is flush with the edges of the box lining. Another way is to have a sliding door moving in vertical runners, as in Fig. 1.

The hinged door may consist of a single piece of plywood ¾ in. thick. Strips of deal 1 in. wide and ⅜ in. thick should be fixed all round the inner faces of the box lining, ¾ in. away from the edge on the kitchen side.

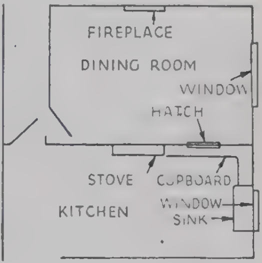


Fig. 4

Brass butt-hinges may be used and a suitable button screwed to the opposite edge of the box frame to keep the door shut. A hardwood handle, or a small metal knob should be fixed near the closing edge of the door.

The corners of the finishing moulding on the dining-room side should be mitred and the edge of the shelf faced with a piece of 1×1 in. hardwood with rounded edges. The ends of this piece extend about a couple of inches beyond the outer edges of the moulding.

HOW TO USE CELLULOSE LACQUER

Cellulose lacquer is easy to apply, dries in an hour or so, is durable, produces a hard and mirror-like surface which can be safely washed with ordinary soap.

It can be applied over old paint, provided such paint is in good condition but it should not be used to cover new oil paint as lacquer solvent attacks linseed oil.

Precautions to Observe. — The liquid constituent is extremely volatile and gives off a highly inflammable vapour. For this reason it should never be used near a naked light. Another important point is that the lacquer must be thinned only with a special thinner supplied by the makers of the lacquer. If brush-work is in view, make sure to get "brushing" lacquer, not the other kind.

The lacquer must not be applied with a cheap brush as it usually sheds bristles, and any attempt to remove them ruins the surface. Get a good brush with soft bristles set in vulcanised rubber.

Before using the lacquer, stir the liquid thoroughly, as indicated in Fig. 1, in the same way as for oil paint. Straining is unnecessary; no skin is formed and thinners are not required at the outset, the lacquer being sold ready for use.

Rubbing Down the Wood.—If the lacquer is to be applied to new wood the latter should be prepared by rubbing down the surface in the direction of the grain, Fig. 2, with fine glass-paper, dusted, and then brushed over with a suitable filler to seal the pores of the wood. If a smooth surface is wanted, this process should not be omitted, especially if the wood is soft. Open pores in wood allow the lacquer to soak in and result in a patchy surface.

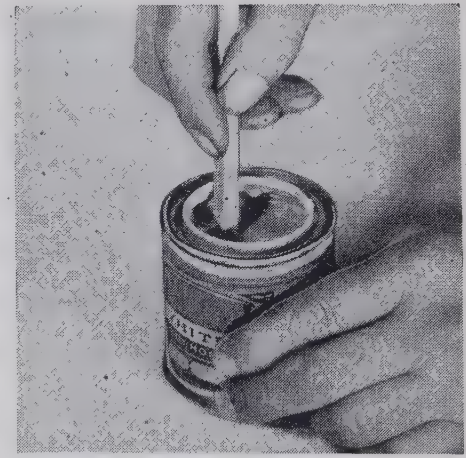


Fig. 1

The filler can be purchased or prepared at home by making a strong solution of gelatine in water. It can be applied with the lacquer brush if it is cleaned and dried afterwards.

Allow the filler to dry, then give the surface a further glass-papering and remove the dust.

Make sure that the wood is dry before applying the lacquer. Dampness is fatal. It is also important that the work should be carried out in a dry, cool place, as humidity in the air may cause condensation to form on the work and so spoil it. A hot atmosphere is as bad as it makes the lacquer set too quickly.

The lacquer should be laid on as rapidly and evenly as possible. The part being lacquered should be covered by a single stroke of the brush, and the sections should be joined before the lacquer has had time to become tacky.

Do not attempt to remove brush marks as the work progresses. These will flow out before it sets. As the work proceeds, it may be necessary to clean the brush in the special thinning solution in order to allow the lacquer to work freely. It may also be found necessary to thin the lacquer. Give the lacquer an occasional stir. Fig. 3 shows the process of applying the lacquer.

A Second Coat.—Before applying another coat, make sure that the first one is hard and then proceed as before. Do not let the brush remain on the surface longer than is necessary because the new coat tends to dissolve the undercoat, a feature which not only renders the lacquer difficult to apply, but will produce a bad finish.

It is a waste of time to apply cellulose lacquer to an old painted surface that is chipped and blistered. It is far better to remove it entirely by blow-lamp and scraper or one of the numerous chemical paint removers. On the other hand, if the paint is only dull and discoloured, a coat of cellulose lacquer will give it new life. Before applying the lacquer, dull the surface with fine glass-paper and wash it down with a damp chamois leather to remove the dust and allow the work to dry. The surface is then ready to receive its new coat, which is done as already explained.

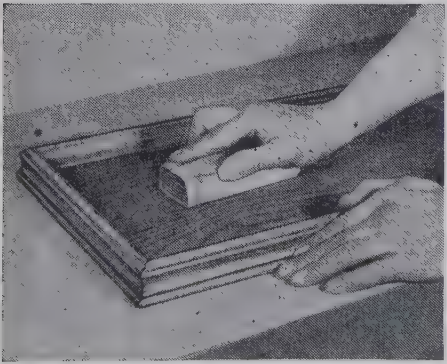


Fig. 2

If the old paint has been varnished, the coat can be removed by softening the varnish with strong liquid ammonia and then scraping.

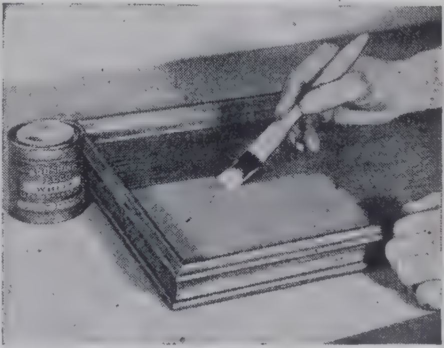


Fig. 3

On Metal.—Cellulose lacquer can be used with equal success for finishing metal objects, but the surfaces to be treated must be devoid of rust, dirt and grease, the removal of which is effected with fine emery cloth.

If the articles have been previously painted, first remove the oil paint and make a fresh start. The result will be more satisfactory.

Transparent Lacquer. — Cellulose lacquer is also supplied in the form of a transparent wash in various colours. This can be used to deepen or to alter the tone of metal vases, trays, etc., but it is particularly successful when used as a decoration on glass.

The cheapest tumbler may be transformed into a richly tinted goblet, while plain glass vases may be enriched with an endless variety of warmly transluscent patterns.

The same care must be taken over its application.

Cellulose lacquer can also be sprayed on the surfaces, thus obviating the use of a brush. Fig. 4 shows a useful portable apparatus for applying the lacquer by this process. The sprayer can also be used with oil paint.

The outfit consists of a foot pump, compressed air container fitted with a pressure gauge, and a spraying pistol to which is attached a glass container for holding the lacquer. The latter can be of a kind specially prepared for spraying or brushing lacquer thinned; two-thirds lacquer to one-third thinner.

Briefly, the action of the sprayer is as follows: Compressed air at a pressure of about 20 lb. per sq. in. issues from the air jet of the trigger valve controlled pistol over a similar jet connected by a metal tube immersed in the finished medium. The velocity at which the compressed air issues from the pistol jet and passes over the container jet draws the liquid up the tube and through the jet and drives it forward in the form of very fine spray.

Such an outfit is useful for painting quickly small work, such as cycle frames, motor-car mudguards, doors, furniture and the numerous odd jobs that have to be done in the home, garden and workshop.

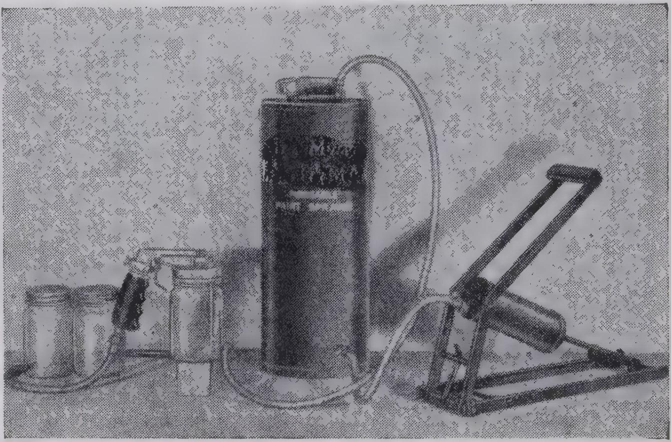


Fig. 4

ENAMELLING A BATH

ORDINARY enamel should not be used for a bath. It is not sufficiently elastic to withstand the effects of expansion and contraction due to hot and cold water, nor the effects of bath salts. Special bath enamel is now obtainable at most oil and colour stores; this, if properly applied, gives a durable and porcelain-like finish.

The number of tools and the variety of materials will depend upon the condition of the old enamel. If this has only lost its gloss and shows no sign of cracking and peeling off, all that is necessary is to give the bath a couple of undercoats and one or two coats of enamel. On the other hand, if the bath has got into such a condition as to expose bare metal and rust, the best course is to remove the old paint entirely and start at the beginning rather than attempt patching.

A good brush with which to apply the medium is essential and this brush should be flat and not less than 2 in. wide. Do not begrudge money which you may be asked to pay for a good brush. Brushes of inferior quality shed their bristles while work is in progress. Before using the brush, make sure it is free from dust. In addition to the enamel, a suitable undercoating must be provided.

The best undercoating to use is that recommended and prepared by the manufacturers to suit their enamel.

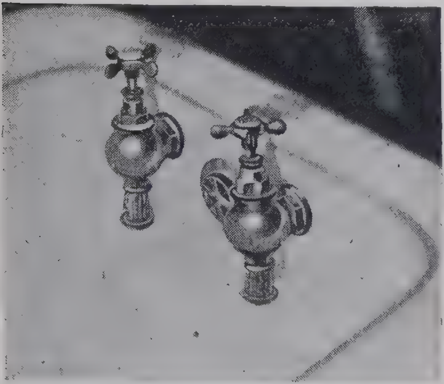


Fig. 1

Renewing Paint.—If the condition of the bath is such that it does not warrant the removal of the old paint, the first thing to do is to prepare the surface for the first coat by ridding it of all traces of grease and soap. This can be done effectively by rubbing the surface with powdered whiting applied with a damp flannel, and then rinsing the bath with warm water.

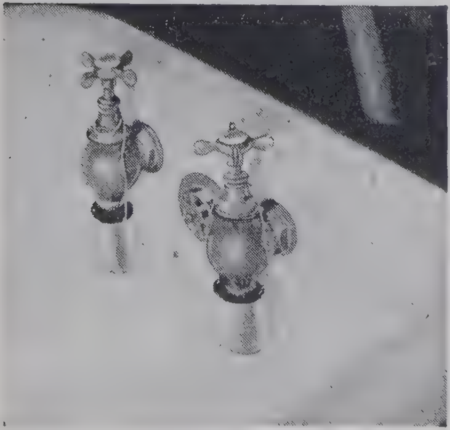


Fig. 2

Next lightly rub the surface with fine sandpaper to remove gloss, as it is essential that the surface be matt, that is, dull, before applying coats. After sandpapering, remove all traces of grit with hot water and allow the bath to dry.

Make sure that the taps do not leak. An occasional drip of water on the work will spoil it. If new washers cannot be fitted at the time, either make the taps watertight by stopping them with corks as indicated in Fig. 1, or hang a tin under each tap to catch the drips as shown in Fig. 2. The first method is the better because tins get in the way when applying the enamel.

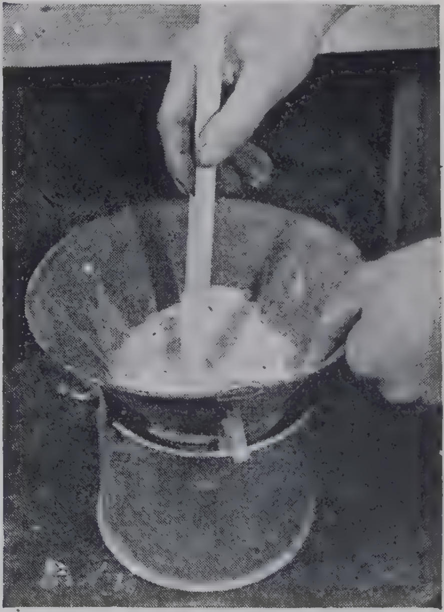


Fig. 3

Thoroughly mix the contents of the undercoating tin before use by stirring it up with a stick of clean wood, making sure that no sediment is left at the bottom. In order to eliminate lumps, it is advisable to put the medium through a strainer, as illustrated in Fig. 3.

Undercoats.—Now give the interior of the bath a coat of thin undercoating, brushing it on evenly and taking care not to apply too much at a time as a thick coat causes cracking, and is fatal to durability. Allow the paint to dry and harden thoroughly. This may take twenty-four hours, after which the paint should be lightly rubbed down with fine sandpaper. Remove all dust and apply another undercoat. Allow it to harden and apply fine sandpaper as before.

The enamelling process requires great care. It is essential that the enamel should be applied without interruption and as rapidly as possible. It sets very quickly.

If the temperature of the bathroom is below 60 deg. F. and there is no handy method of raising it, such as by use of an electric stove, it is advisable to defer the enamelling to a warmer day.

The enamel must be thoroughly mixed before attempting to apply it. If it is found too thick for easy working do not add thinners such as turpentine, but pour the contents of the container into a convenient receptacle and place it in a bowl of hot water in the manner shown in Fig. 4. This will reduce the consistency of the enamel and allow it to flow easily.

Fig. 5 shows a diagram of the sequence of operations in applying enamel to a bath fixed close to a wall. Start in the middle of the long edge 1 and work downward toward each end 2 and 3. Continue round 2 and 3 and the bottom, 4, and finally the front side and the top edge 5, making sure that the entire surface has been covered. If a small gap between the joints is apparent, remedy the defect at once by just touching the place two or three times with the tip of a brush lightly charged with enamel. Do not attempt to lay it on as in painting, as this would leave a mark when dry. Remember that one of the secrets of success in enamelling is to join up each section before they set.

Having completed the enamelling, the surface must be allowed to set and harden, a process which will take two or three days or even more. Keep the bathroom free from dust but allow plenty of ventilation.

Before using the bath, fill it with cold water and allow it to remain there for a day. When filling the bath, make a practice of turning on the cold water tap first until the bath is partially filled and then adding the hot water. If this is done and the precaution taken to swill the bath with water after use to get rid of soapy deposits, the enamelled surface should, with ordinary care and normal use, last several years.

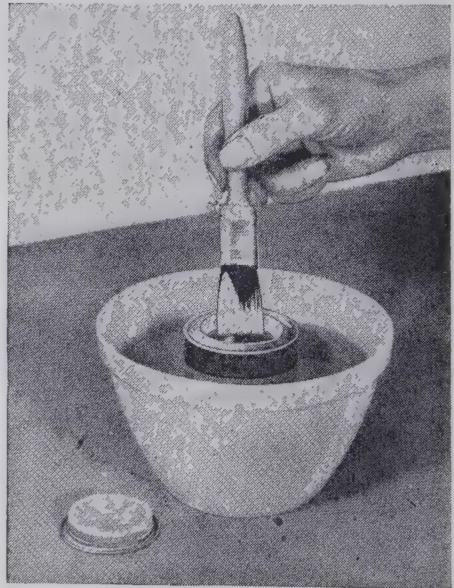


Fig. 4

Repainting.—A bath that is so bad as to necessitate removal of the old paint before it can be refinished, should be treated in the following way. Apply to the inside some special chemical paint-softener obtainable at most oil and colour stores, or a home-made preparation consisting of lime, caustic potash and water, mixed to the consistency of a paste. Apply this with a fibre brush, or a piece of rag wrapped and tied to the end of a stout stick. Allow the softener to remain on the surface for a considerable time before scraping it and the old paint off. Use an old knife for scraping purposes. Care is needed when handling these preparations as they are likely to cause damage to other articles if allowed to come in contact with them. Protect the hands with rubber gloves.

Having scraped off every particle of old paint and removed the sludge, clean rusty areas by scraping and the use of emery cloth. Then remove all traces of the alkali with vinegar and water and swill the bath out with copious supplies of water. When dry, give the bare metal two coats of aluminium paint, allowing the first coat to dry before applying the second. After sandpapering the final coat of aluminium paint, give the surface two coats of undercoating and finish with the enamel as previously described.

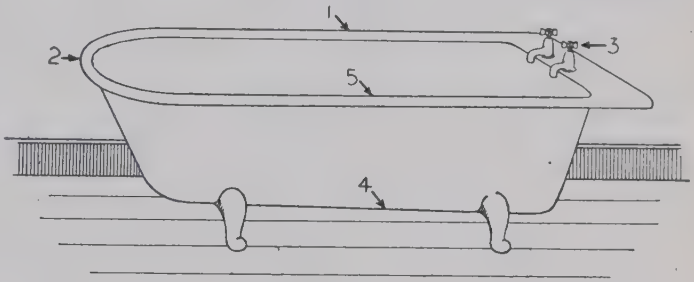


Fig. 5

If it is desired to give the bath two coats of enamel, the gloss of the first must be removed. This can be done effectively with fine pumice-powder, carefully applied with a damp flannel.

COLOUR SCHEMES AND DECORATION

Generally speaking, there are three accepted ways of ensuring colour harmony, which are simple to carry out, viz. :

Dominant Harmony, when different tones of the same colour are used, as light, medium and dark blue; light, medium and dark red or any two or three tones of any one colour. Note the dark tones should be about one-eighth area only to the remaining seven-eighths of the other tone, or tones.

Complementary Harmony, i.e., combinations of two or three complementary colours, viz.: two colours—blue and orange, violet and primrose, crimson lake and green, black and grey, etc. Three colours—green, violet and grey; mauve, pink and grey; primrose, violet and blue; orange, violet and blue; crimson lake, violet and blue, etc.

Colour Contrast, i.e., yellow, red and blue. These three primary colours were used by Italian Renaissance artists as symbolising "life" in the following category: morning-yellow, evening-red, night-blue.

The latter colours are especially suitable for a child's room, as children love bright colours, but they need

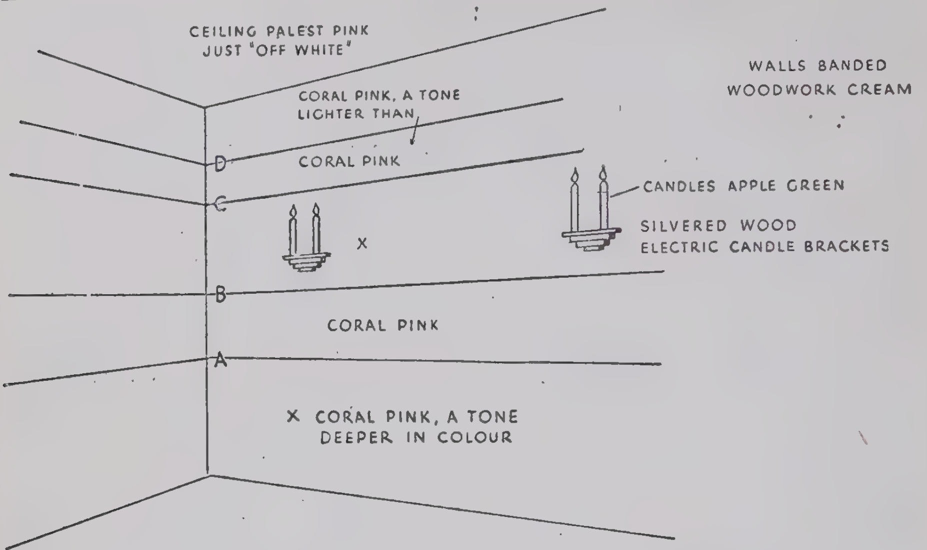

CEILING PALEST PINK
JUST "OFF WHITE"
CORAL PINK, A TONE
LIGHTER THAN
CORAL PINK
WALLS BANDED
WOODWORK CREAM
CANDLES APPLE GREEN
SILVERED WOOD
ELECTRIC CANDLE BRACKETS
D
C
B
A
X
CORAL PINK
X CORAL PINK, A TONE
DEEPER IN COLOUR

Fig. 1

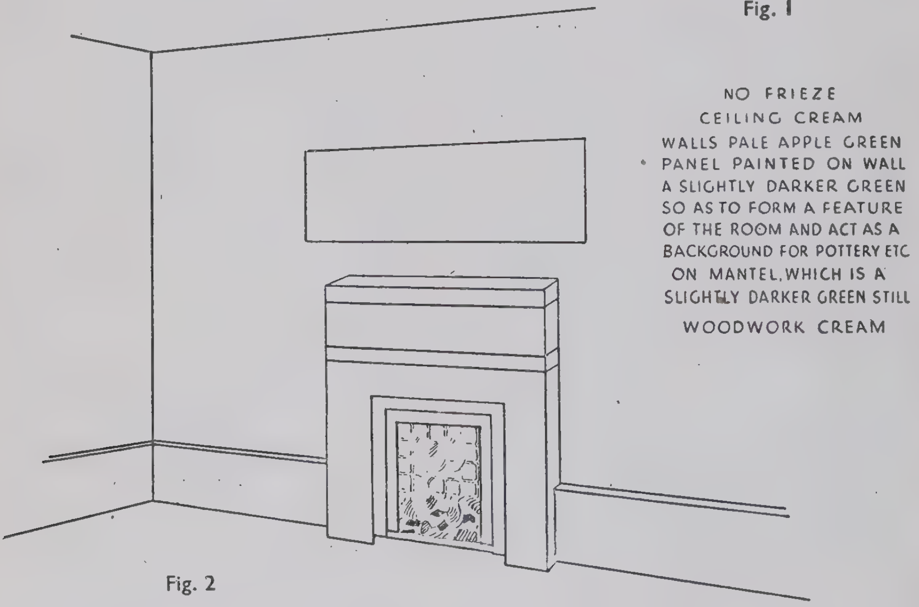

NO FRIEZE
CEILING CREAM
WALLS PALE APPLE GREEN
PANEL PAINTED ON WALL
A SLIGHTLY DARKER GREEN
SO AS TO FORM A FEATURE
OF THE ROOM AND ACT AS A
BACKGROUND FOR POTTERY ETC
ON MANTEL, WHICH IS A
SLIGHTLY DARKER GREEN STILL
WOODWORK CREAM

Fig. 2

handling carefully to avoid placing the yellow next to the red. The arrangement should be yellow against blue and blue against red.

All the colours mentioned can, of course, be toned to the lightest and most delicate variations of shade.

With regard to colour tones, all the light colours, as primrose, cream, buff, stone, coral pink, very pale blues and greens, etc., are receding colours.

Dark reds, blues, browns, greens, greys and black are advancing colours. The darker they are the more they advance.

Receding Colours make a small

room look larger, as they reflect light, while advancing colours make a large room look smaller, or their effect on a small room is to make it appear still smaller as they absorb light.

Apart from considering the size of the room, its situation has to be taken into account.

For a room facing north, it will be best to gain a "sunshine" effect by colouring the walls primrose, cream or coral pink, etc., while rooms facing south should be decorated in the quieter colours such as pale green, pale blue or pale grey.

It should be observed that light tones of the same colour, or light shades of complementary colours are much more effective than violent contrasts.

The illustration in Fig. 1 shows diagrammatically a modern style in colour decoration called banding. These horizontal bands help to make a small room look larger, and used in conjunction with the receding colours mentioned carry the illusion much further.

Great care must be taken not to make these bands aggressive so it will be best to keep them a tone lighter than the wall in order to create a shadow effect. The placing of the bands is most important. Starting from the floor level, take one third of the total height of the wall and draw the line marked A. Then taking half the total height of the wall above, draw line B.

Now measure down from the ceiling a little more than half of the wall space left and draw line C. Then divide the space between C and the ceiling into seven parts and measure down from the ceiling four parts and draw line D.

The colour scheme suggested is in tones of coral, but it could be carried out with equal success in any colour provided a pale shade is employed.

Colour scheme, Fig. 2, is also modern. The walls are perfectly plain and there is no frieze. This is an advantage in a room with a low ceiling, as it adds height to a room, whereas a frieze has the effect of lowering a ceiling.

This scheme in tones of green, as indicated would be very refreshing and restful for a sunny room.

The mantel panel should only be a tone darker than the wall and the mantel a tone of green, still darker. The horizontal bands on it "come back" to the same colour tone as the panel, which, by the way, is painted on the walls.

It is interesting to note that the cream ceiling "comes back" on the skirting and gives unity in decoration.

Scheme three, Fig. 3, shows an ordinary room with a frieze, dado and skirting. The moulding of the frieze may be painted in the same deep ivory as the skirting and the dado line or moulding, of the same colour.

The colour gradations in this room are interesting. Starting from the ivory white ceiling, the ivory gradually deepens in tone. The dove-grey walls should be of the same tone as the light ivory frieze.

This scheme could be equally well done by leaving out the dado as shown but in this case the dove-grey walls would be carried down to the skirting.

Colour scheme No. 4, Fig. 4, shows a panelled-out effect, without actually panelling the room. The divisions are strips of paper carefully pasted on, or if there is a really good wall surface they can be painted direct on the wall.

The panelling-out needs some thought; the smaller wall surface should be taken first. Then—as far as possible—set out the panels in a right proportion as shown.

Pale primrose (or lemon) walls with cobalt blue divisions would make a very happy room with a sunshine effect, that would be an ideal treatment for a north room.

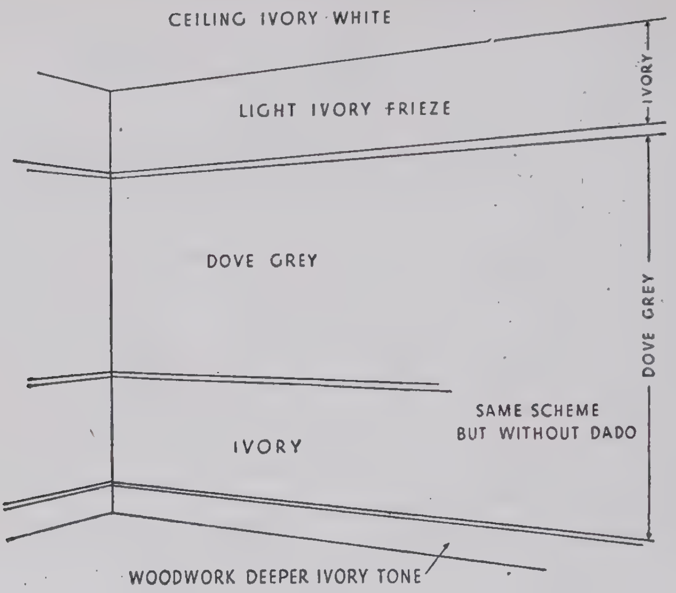

CEILING IVORY WHITE
LIGHT IVORY FRIEZE
IVORY
DOVE GREY
DOVE GREY
SAME SCHEME BUT WITHOUT DADO
IVORY
WOODWORK DEEPER IVORY TONE

Fig. 3

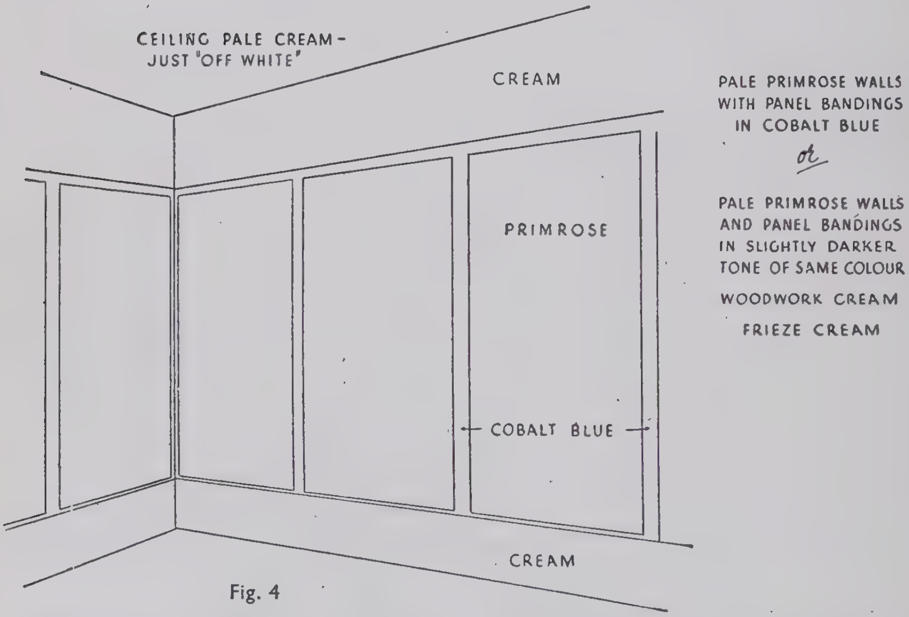

CEILING PALE CREAM - JUST "OFF WHITE"
CREAM
PALE PRIMROSE WALLS WITH PANEL BANDINGS IN COBALT BLUE
or
PALE PRIMROSE WALLS AND PANEL BANDINGS IN SLIGHTLY DARKER TONE OF SAME COLOUR
WOODWORK CREAM
FRIEZE CREAM
PRIMROSE
COBALT BLUE
CREAM

Fig. 4

Alternative treatments are as follows: For a room facing south, either grey, light blue, light green, mauve, lilac or turquoise could be used with advantage.

When planning a colour scheme for any one room, the furniture and the colours of the cushions, etc., should be taken into consideration.

PRACTICAL NOTES ON GEYSERS

THERE are two kinds of geyser in which the gas is burned, the white flame, and the Bunsen flame type. The former uses gas direct as in an old-fashioned gas burner. It does not mix air with the gas before it issues from the burner. The other type uses a Bunsen flame like the household gas cooker. This mixes air with gas and gives a blue flame. The heating properties of this type are greater for a given gas consumption but the geyser is less safe than the white flame type.

Fume Dangers.—No geyser is safe unless there is efficient and continuous circulation of pure air through the geyser itself: from the inlet for air to the burners, to the exit after the hot gases have risen in the geyser flue and escape, by reason of their heat, into the atmosphere. The Bunsen denudes the atmosphere of oxygen. Hence a double danger of insufficient oxygen and air contaminated.

The bathroom should have a vent below the geyser.

This should preferably be not more than 4 in. above the level of the floor of the room. This ventilator will act in two ways. If carbon monoxide is given off by the geyser, it will fall, being heavier than the atmosphere, and instead of filling up from below and eventually reaching the head of the occupant of the bath, it will flow out of the vent at floor level.

The section of a house given here, Fig. 1, shows several alternative arrangements of geysers and flues. The floor outlet is at A. The outlet for the gas flue is important. It cannot be allowed in the bathroom and must be conducted into the open air.

Often the geyser is provided with a sheet metal flue pipe which runs through the outside wall and extends upwards for a few feet as at B. It is important that the outlet of this pipe should be so arranged that down draught cannot get into the flue and blow back on to the burners. Where the geyser is on the ground floor, the flue pipe should be taken through the wall to an outside vertical pipe, which should not be placed too near the wall, since air eddies often come down a wall. The outlet should be well above the point at which the flue emerges from the wall and should be about a foot or 18 in. from the face of the wall, if on the first floor. It should on no account come up under the eaves of the house or under guttering. If the top end of the pipe comes near the gutter or eaves, it should be carried out and up past them.

The Vent Pipe.—It should have a mushroom cowl at the top to stop down draughts and to prevent birds building nests in the pipe. The cowl should be of such a shape that air currents striking it draw hot air out of the geyser.

At C the pipe is extended right up through the roof and at D it terminates in the false roof or attic space. The latter arrangement avoids all danger of down draughts and of obstruction by birds, but it should only be adopted if there is ample air space and ventilation in the roof. At E the flue is shown carried into the existing chimney. This is a very good method, and in the case of the bathroom it can be arranged by carrying the flue through into the chimney breast in the party wall.

When the geyser is on the ground floor it is generally away from chimney flues and the arrangement at B will be found most suitable. It is convenient and safe to have a baffle fitted on the flue above the geyser. This absolutely prevents down draught. It is generally a light mica swinging vane which closes when the air direction is altered but opens again immediately the draught is withdrawn and lets rising fumes out again. Its normal position is open.

When fixing a geyser, it is important to see that the gas and water supply pipes are of adequate size. A pipe smaller than that intended by the designer will not give heating satisfaction. For gas as now supplied, the following sizes of gas and water pipes (inside diameter) are recommended.

Gallons per minute	*Gas pipe*	*Water pipe*
1½	½ in.	½ in.
2	⅜ „	½ „
3	¾ „	¾ „
4	1 „	1 „

Water Pressure.—This is for cistern water supply when the cistern is above the first floor. In the cases of bungalows, where the cistern is nearer the geyser, the water pipes should be 25 per cent. bigger in bore. The bottom of the cistern should be at least 10 ft. above the top of the geyser to get the best results; but, where such height is not available, the same effect can be obtained by increasing the bore of the water pipe from cistern to geyser. For geysers with automatic valves controlling the gas, the water pressures should not be less than 5 lb.—that is, the pressure obtainable with the cistern 10 ft. above the geyser. But geysers can be had with light-pressure valves when this cannot be obtained.

It is often an advantage to have a separate meter for the geyser and often the gas meter in a house is too small if a geyser is subsequently fitted. Geysers consume more gas than any other domestic gas appliance.

As a guide to the size of meter, it may be stated that a geyser heating 2 gals. of water per minute should have a ten light gas meter. For 3 gals. it should be twenty lights, and for 4 gals. fifty lights.

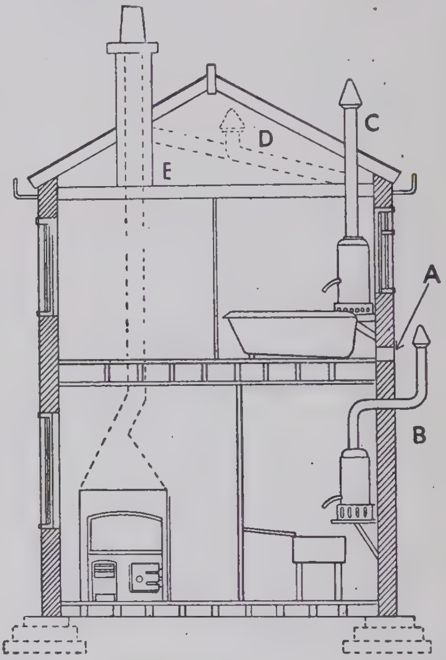


Fig. 1

In a good geyser, 25 to 30 ft. of gas (depending upon the calorific value) will heat 30 gals. of water to 40 deg. F. above that of the cold water supply, or from 60 to 100 deg. F.

Here are some figures as to temperatures, sizes of baths, times required and size of geyser required, to give a fully efficient service. To give a hot bath averaging 98 deg. F. with a 5 ft. cast-iron bath in 20 mins. a 2 gal. geyser is required. For a 5 ft. 6 in. bath for the same time and temperature a 3 gal. geyser, and with a larger bath a 4 gal. geyser. If a hotter bath is required—say about 105 deg. F.—for a small bath (5 ft.), a 3 gal. geyser will be required and so on in proportion.

MODERNISING A FIREPLACE

It is a very simple thing to encase these fireplaces with wood, which may be taken out when moving to another house. The work can be done very cheaply, for it is possible to make the wood mantel out of old packing cases (machinery cases) which, if treated properly, would look quite as well as red deal, pine or American whitewood.

The latter two woods are, however, cheap and save labour, for if packing case wood is used it must be glass-papered to obtain a proper surface. If a really fine, smooth surface is required it is best to use the pine or whitewood.

If the furniture is of Jacobean design it will be best to make the mantel out of packing cases. If the furniture is modern the fireplace should be made of pine or whitewood.

The following article deals with how to modernise an old iron mantelpiece, size 4 ft. 4½ in.×4 ft. 1 in. out to out, with packing case wood. The measurements here given may have to be altered to fit your special requirements.

Construction.—First saw out the following pieces of wood: one piece size 4 ft.×9×¾ in. for the frieze, two pieces each 4 ft.×9×¾ in. for the two sides.

Now take out all the nails and, if necessary, wash the wood in soap and water. Allow time to dry, then plane diagonally to ⅝ in. thick. This is best done with a smoothing plane, using short circular strokes in a diagonal direction. Do not worry about the resulting rough surface so long as it is reasonably level.

Next, fit the two side pieces under your iron mantelshelf, hand-tight. You will see in diagram A, Fig. 2, that the iron shelf is hollow. With these pieces still in position, place the frieze on them—well up under the iron shelf and pin it on to the side pieces with long veneer pins.

Then take this structure down (you will need a friend to help you) and place it upside down on a table. From the back, screw on the two side pieces—five screws in each case.

Replace the structure so as to obtain the width of the side returns; see side view in Fig. 1. These will be the same length as the sides and about 3 in. wide. Cut them to length and scribe them on to the skirting moulding. This is best done by using a cardboard template.

Now saw and chisel these pieces out (see D, Fig. 1) and fit from time to time.

Take down the structure and pin on the two returns from the front with 1½ in. panel pins, 6 in. apart.

Cut out and square up a piece of wood, size 2 ft. 6 in. ×8 ×½ in., for the bases and their returns (on the outer edges only). Set the gauge to 1 in. and gauge a line along the face (top) edge. Then on the face edge gauge a line ¼ in. from the face side. Rebate this out, or it may be done with a chisel.

As the bases are butt-joined, cut two pieces the exact length of the 3 in. side width, pin them on and then pin on the two front pieces.

See that the bases project beyond the sides (pilasters), EE Fig. 1, for although they are not "returned," here they prevent the movable copper panels FF from slipping out.

The work should now be turned over and the bases firmly screwed from inside.

Now run out some moulding, details of which are shown at C in Fig. 2. About 5 ft. will be required. Work this moulding in the same way as described for the base moulding.

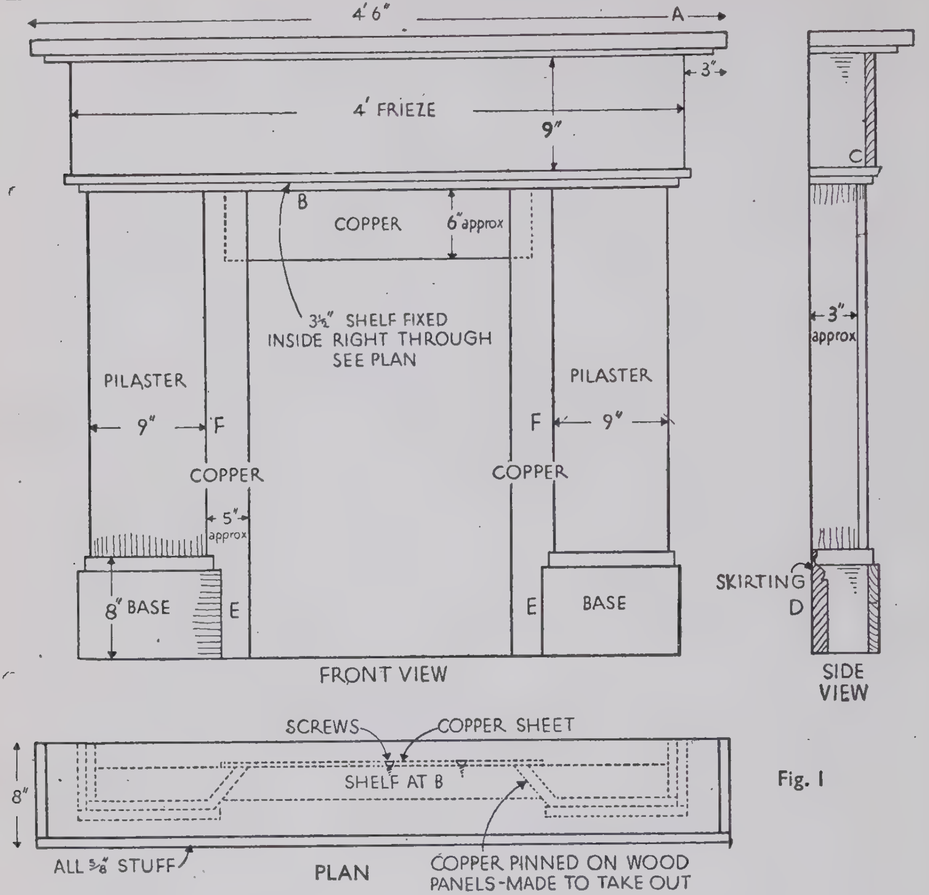

4′ 6″
A
3″
4′ FRIEZE
9″
C
B
COPPER
6″ approx
3½″ SHELF FIXED INSIDE RIGHT THROUGH SEE PLAN
PILASTER
9″
F
COPPER
5″ approx
8″ BASE
E
PILASTER
F
9″
COPPER
E
BASE
3″ approx
SKIRTING
D
FRONT VIEW
SIDE VIEW
SCREWS
COPPER SHEET
8″
SHELF AT B
ALL ⅝″ STUFF
PLAN
COPPER PINNED ON WOOD PANELS-MADE TO TAKE OUT

Fig. 1

Then cut a piece for the 3½ in. wide shelf and pin this in position so that the front edge comes level and below the face of the frieze. This means the shelf will have to be notched out at both ends 9×¾ in.

Now pin on the end pieces of moulding and then the front piece so as to cover the end grain of the return pieces.

As this part of the structure is now complete, give it a good wash down with warm water then allow it to dry and then give it a good glass-papering with middle 2 and fine 2.

Next cut a piece of wood the exact size of the old iron mantelshelf. Run out, as before described, sufficient moulding to go round, as shown in the diagram A. Pin this on all round, keeping the moulding level with the face side of the shelf so that it will drop well down (hand tight) and cover the unsightly iron moulded edge. Wash the shelf and paper it as described above.

The Metal Panel.—Purchase a sheet of copper, brass or chromium metal, size 2 ft. × 6 in., and bore a series of holes ⅛ in. in diameter along the top edge about ⅜ in. in from the edge.

If a hammered effect is required put it on a piece of hardwood, and with a small round-headed hammer, tap it down from the centre in parallel strokes outwards to the ends; then, still from the centre, tap it out vertically to top and bottom edges. From time to time turn the metal over and flatten it with a mallet, still working outwards.

Lacquering.—Clean the copper with metal polish and to save labour, lacquer it in the following manner:

Purchase a small bottle of colourless lacquer and a camel-hair brush of large size. Put the copper sheet on the gas stove with the jet burning low.

Test the heat of the copper by touching it, and when a trifle warmer than comfortable to the hand, put on the lacquer quickly with round even strokes, taking great care not to go over any part twice. It is advisable to experiment on a small piece of copper first, and remember that the metal must be perfectly clean.

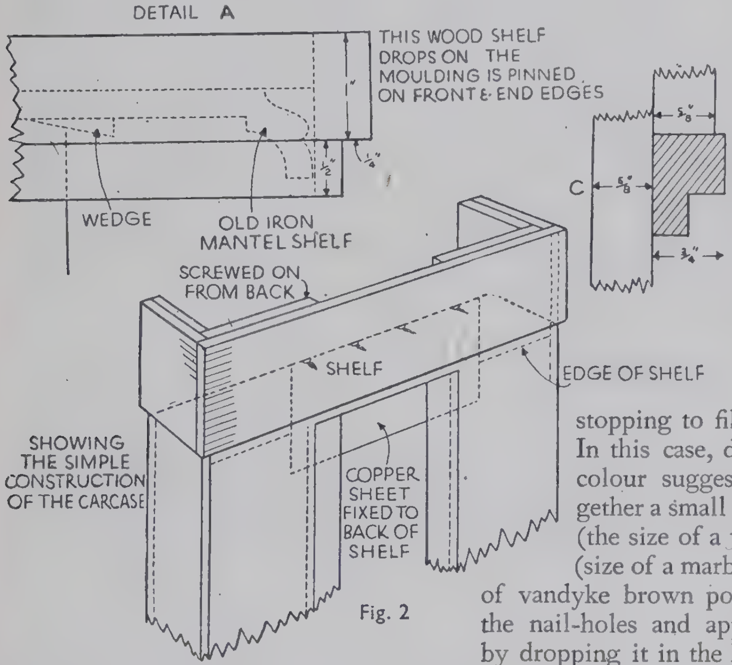

DETAIL A
THIS WOOD SHELF DROPS ON THE MOULDING IS PINNED ON FRONT & END EDGES
1"
1/2"
1/4"
WEDGE
OLD IRON MANTEL SHELF
SCREWED ON FROM BACK
SHELF
EDGE OF SHELF
SHOWING THE SIMPLE CONSTRUCTION OF THE CARCASE
COPPER SHEET FIXED TO BACK OF SHELF
C
5/8"
5/8"
1"
3/4"

Fig. 2

Now screw on the copper to the back edge of the $3\frac{1}{2}$ in. shelf, so that it hangs down and hides the top tiles.

The Side Panels.—Next cut out and bevel the edges of the two side panels, as shown in the plan Fig. 1. These will probably be about 5 in. wide. They fit up under the $3\frac{1}{2}$ in. shelf and behind the inside projections of the base. Fit these in first, then prepare the copper sheets as before described and screw the metal on with small copper round-head screws.

The angle of these copper panels will be 45 deg. approximately, but as they rest against the dropped copper sheet it will be easy to find the exact angle required and then the inside edges of the pilasters can be bevelled off to fit.

Fit the mantel in, drop on the shelf and fit in the copper side panels.

Staining and Polishing. — When everything is satisfactory, determine the colour you require it and make up some stopping to fill the nail holes. In this case, dark brown is the colour suggested, so melt together a small piece of beeswax (the size of a walnut) and resin (size of a marble). Add a pinch of vandyke brown powder. Punch in the nail-holes and apply the stopping by dropping it in the holes.

Now give the whole work a good glass-papering, taking care to work with the grain and pressing on the forward stroke.

Mix some vandyke brown powder with some .880 spirits of ammonia and mix to a paste. Thin with cold water to the required colour. Stain the work, using the brush with the grain, allow to dry, then vigorously rub the mantel with coarse canvas (hessian).

Finally, polish it with one of the well-known wax polishes.

HEATING AND LIGHTING POINTS SHOULD BE EASILY ACCESSIBLE

ELECTRICAL REPAIRS AND CONSTRUCTION

MAINTAINING AN ELECTRICAL INSTALLATION IN GOOD REPAIR

An electric installation demands as much attention as the gas and water systems. Make a periodical examination of the various components, and effect necessary repairs at once.

Fortunately, most breakdowns in the domestic electric light and power systems are due to minor defects which are easily remedied.

Defects in the main wiring seldom arise unless the installation is old or was badly installed at the outset. But it is good to have the wiring tested every few years by an electrician who, for a small fee, will report on its condition. Examination of the components other than the actual wiring, which is not dealt with in this article, should be carried out systematically.

Carry a pencil and paper and jot down items such as defective switches, flexes, and any accessories that need attention. Start from the main switch, then the distribution fuse-board from which the various circuits radiate, and test the switches, fittings, plugs, lamps, wherever they are installed.

Always Switch Off.—It will be an advantage in some cases to have the main switch, which entirely disconnects the installation from the supply, at the on position, but no work should be carried out with live installations.

The Fuses.—Start by examining the fuse-board, first making it dead by opening the main switch.

This fitment, Fig. 1, has on it a number of porcelain fuse-carriers arranged in pairs (a pair to each sub-circuit) and separated by a fillet, generally of asbestos or ebonite. Each fuse-carrier supports a thin wire between its terminals which blows or melts should a current in excess of the normal flow through it.

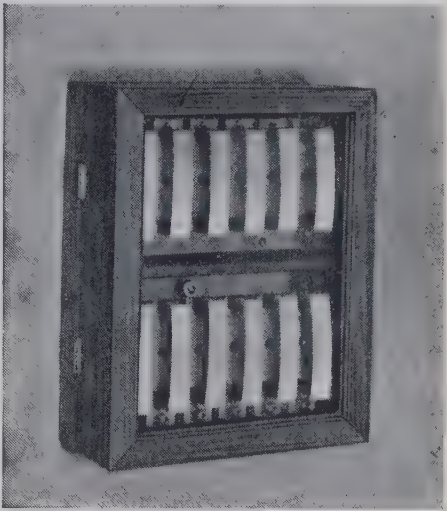


Fig. 1

When replacing a blown fuse, it is essential that the wire should be of the correct capacity. Cards of wire can be obtained cheaply at most electrical shops. One should be hung beside the fuse-board so that it is ready when wanted. Care must be taken when replacing a fuse not to screw up the terminals too tightly over the ends of the wire, as they may cut it, although the breakage may not be visible. To ascertain whether the fuse is intact, insert a knife or bradawl under the wire and lift slightly to put a little tension on it, as indicated in Fig. 2.

In one kind of fuse-board, known as the channel type, the fuse-carriers are held in position by means of bent metal clips that grip the metal ends of the carriers as shown in Fig. 3. If your fuse-board is of this type, make sure that the clips make tight contact with the carriers and that they are free from corrosion or you may be troubled with flickering lights. The clips may be adjusted with pliers, while slight corrosion can be removed by judicious scraping with a penknife.

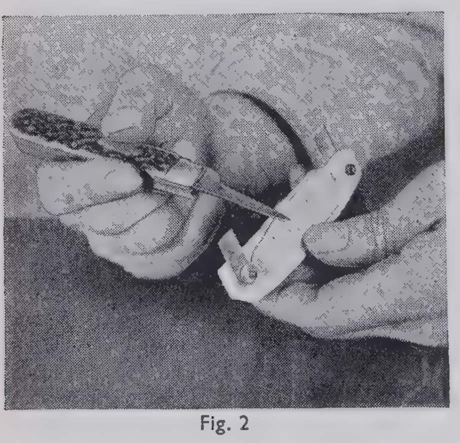


Fig. 2

If corrosion has rendered the metal so fragile that they cannot be adjusted or scraped without breakage, it is wise to discard the fuse-board and replace it with a modern one.

Replacing the Fuse-board.—The fitting of a new fuse-board is simple. Disconnect and remove the old one. First remove the fuse-carriers and the glazed cover, and disconnect the top row circuit wires by unscrewing the terminal screws, starting at the left-hand end.

Label each wire 1, 2, 3 and so on, as each individual wire is withdrawn, in order that they may be connected to the new fuse-board in the same sequence. Then disconnect the bottom row of wires and label these in the same manner, finally withdrawing the thick cables from the bus-bar terminals. The circuit wires are now ready to be connected to the new fuse-board.

Remove the cover and fuse-carriers from the new fuse-board and drill suitable holes in the latter for fixing. Then connect each wire to its respective terminal and fix the board with screws. A fuse-board should never be fixed by nails. Replace the cover, fit suitable fuse wire to the carriers and reinstate them in their sockets. Turn on main switch to test installation.

Many faults arise from defective ceiling pendants. These fittings usually consist of a ceiling rose to which the circuits are attached and from which a lampholder is suspended by means of a twin flexible wire, Fig. 4.

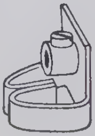


Fig. 3

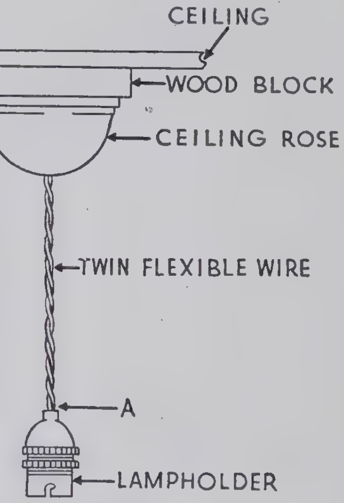


Fig. 4

Faulty Ceiling Lights.—If the lamp in such a fitting fails to light when switched on, and assuming that the fuses are intact and other lights on the same circuit light in the normal way, examine the lamp to ascertain whether the filament is intact. As the filament of a pearl or frosted lamp cannot easily be seen, test the lamp in another fitting. It is wise to treat a clear lamp in the same way as a broken filament cannot always be discerned. If the lamp is in order, examine the lampholder.

The bayonets or projections that make contact with the small metal pieces at the top of the lamp-cap may be out of alignment. This may be due to a broken porcelain interior which holds the bayonet-sockets, or the locking-ring which keeps the interior, top and bottom of the holder together has worked loose, causing the bayonets to be in line with the lamp leads instead of at right-angles to them.

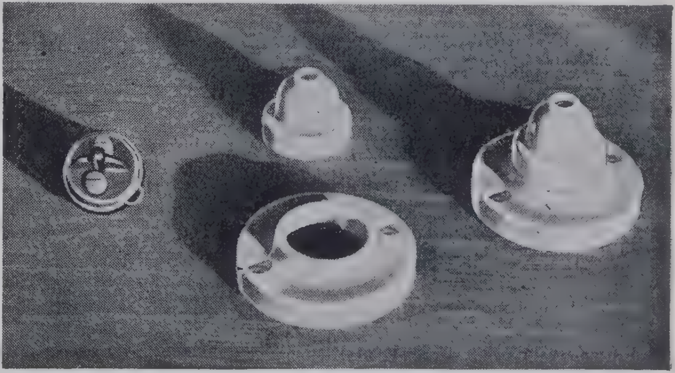


Fig. 5

A broken interior cannot be repaired. If the lampholder only needs adjusting, remove the locking-ring and reinstate the porcelain interior in its correct position.

Other defects associated with lampholders are weak springs inside the bayonets, causing imperfect contact, and stuck bayonets. The former cannot be remedied, while the latter can generally be eased back into position with pliers. A drop of thin lubricating oil will be helpful.

In modern lampholders made of bakelite a separate porcelain interior is omitted, as the bayonets are moulded in the bakelite, but the principle upon which they act is the same.

Faulty Flex.—The next part to examine is the twin-flex connecting wire. The most likely place to find any fault is near to the wire's entry into the top of the lampholder, as indicated at A in Fig. 4. If the wire is defective at this point, and the other part is in good condition, the lampholder should be removed, the faulty end cut off, the wires bared and refitted to the lampholder. On the other hand should the flex be hard and brittle it will be safer to rewire the pendant.

Obtain some double-vulcanised india-rubber-covered flex in preference to the single vulcanised kind. It is thicker and may cost a little more for each yard but will last four times as long as the other.

When making the connections at the ceiling-rose, make sure that all strands of the flex are securely fixed under the terminals, and take care to anchor the wires correctly so that the terminals do not take the weight of the pendant. In the event of the ceiling-rose being out of order or cracked, replace it with the type shown in Fig. 5, which is easily fixed and has an excellent device for gripping the flex.

The flex by which most portable electrical devices is connected to plugs and sockets is a weak part of the installation and is subjected to a great deal of wear. All connecting leads should be kept in first-class order, and as soon as the rubber covering shows signs of perishing, they should be renewed.

Flex should not be allowed to remain alive, even if a switch is inserted at the further end of the wire as, for example, a key-switch on a standard lamp. Disconnect the lead from the circuit by removing it from the plug socket, or by opening the switch where the connection is by means of a combination switch-plug. Do not use ordinary flex wires and staples when extending or adding extra points. Insurance companies object to this makeshift.

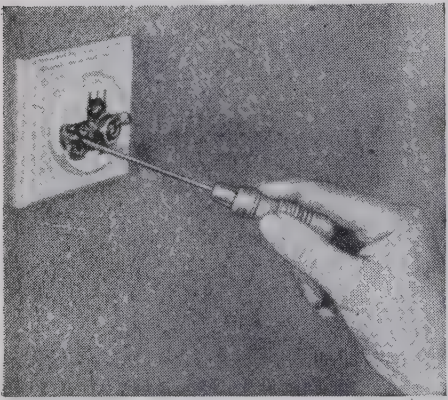


Fig. 6

Good switches are remarkably efficient and trouble-free on the whole. Bad contact between the knife blades and the metal terminal-pieces upon which the blades make and break the circuit, giving rise to flickering lights, is a common defect, easily remedied with a screwdriver by bending the contact pieces as shown in Fig. 6. Other faults which sometimes arise include a broken spring or a broken link connecting the switch knob to the knife blades. If these defects occur it is better to replace the switch rather than attempt to repair it.

Switch Blocks upon which surface switches are mounted sometimes become loose on the wall. It will be necessary to disconnect and remove the switch to get at the fixing screws. If the wall plugs are loose, refix them with neat portland cement; allow it to set and then refix the block and switch.

Switch Plates which cover sunk switches should be examined, and if any are found loose they should be tightened by screwing up the fixing rings.

To keep heavy duty switches—such as those used for electric radiators—in good condition, always make a point of breaking the circuit by first opening the controlling switches on the radiator itself as this gradually reduces the load and prevents excessive arcing at the contacts of the master switch.

OVERHAULING DOMESTIC APPLIANCES

THE easiest form of continuity tester to construct is one that comprises an ordinary electric bell, a dry battery and a length of twin flex. The one terminal of the battery is joined by a short length of wire to one terminal of the bell, and the other bell and battery terminals are connected to one end of the flex and the two wires at the other end are bared for about an inch up. These bared ends may be soldered to stiffen them, or small plugs, such as are used for aerial plugs on a wireless set, fitted to them.

The bell and battery can for convenience be mounted on a board or in a box. The operation of the tester is that the two bare ends of the flexible wire are placed across a circuit, through which there should be continuity, and if the bell rings, this is an indication that the circuit is in good order.

It will be appreciated that the tester

can be used only for continuity tests of low resistance, and cannot be employed for checking faults in such things as electric lamps or the windings of motors.

In practically all electrical appliances the most common source of trouble is the flexible lead.

The first proceeding, therefore, in tracing a fault in a vacuum cleaner is to look at the connections in the plug on the end of the lead, and at the ends of the flex. A slight pull on the flex will generally reveal a break near the end, and the flex can be cut off above the break and the plug put on again.

If no fault is discovered, the lead itself must next be tested.

Dust-bag Cleaners.—In a vacuum cleaner of the dust-bag type, where the whole cleaner is moved in the action of cleaning, the lead is generally divided into two parts—the external part for plugging into the supply (or, in other words, at the switch), and the part which runs down from this point in the hollow of the handle. One wire of the external lead connects direct to one wire of the lead in the handle, the other two wires being connected together through the switch (see Fig. 1). The latter section usually ends in a socket fixed in the base of the handle which receives a plug attached to a lead from the motor as in Fig. 2). Sometimes the internal section of the lead runs straight through the bottom of the handle and plugs into an attachment on the motor casing itself (see Fig. 3).

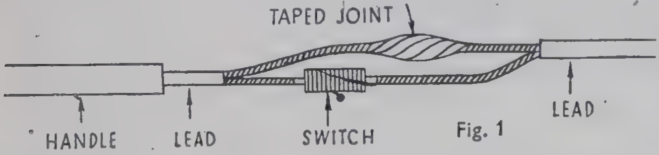


Fig. 1

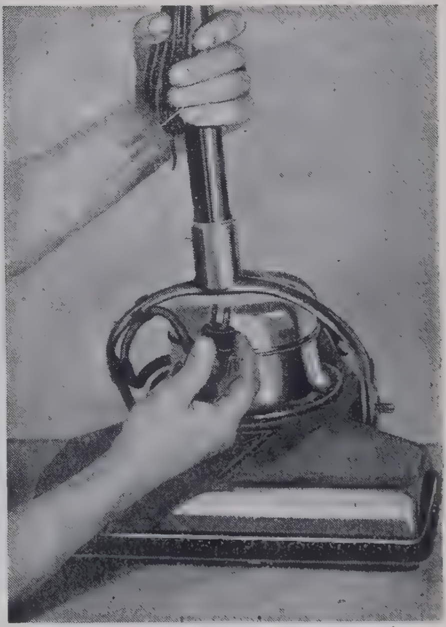


Fig. 2

First of all, test the lead as a whole. To do this, disconnect it from the motor—i.e., unplug it from the base of the handle or from the motor casing—and see that the switch is turned on. Now touch the pins of the plug with the bared ends of the continuity tester, as shown in Fig. 4. If the bell rings, there is a short circuit. If it does not ring, joint the two ends of the lead at the bottom of the handle with a piece of wire (fuse wire is the

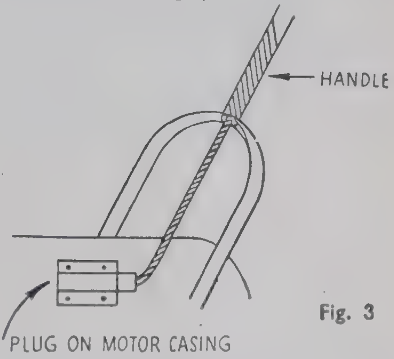


Fig. 3

most convenient) and touch the prongs of the plug with the tester, as before.

If the bell rings the lead is in order, but if it does not there is a break in the circuit, either in the lead or in the switch.

It is advisable every now and then to check the tester itself, by touching the bare flexible wire ends together to see if the bell will ring briskly and loudly. Another point, be sure you firmly make the contact across the points being tested.

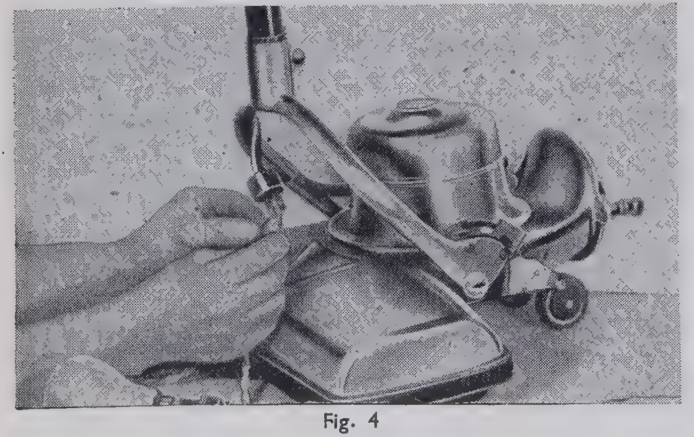


Fig. 4

Locating the Fault.—The next step, if the lead is at fault, is to find where the break is, and to do this it is necessary to disconnect the external part from the part inside the handle and from the switch.

In the majority of cleaners it will be found that a section of the handle at the top is removable, being only held in position by a bolt. When this is taken off, it is easy to get at the switch, which can be withdrawn after its fixing screws are removed.

Some of the wire from inside the handle will be drawn up with the switch and it will be seen that the connections are as illustrated in Fig. 1. The wire that is not connected to the switch will probably have a taped joint beside or underneath the switch. If this is so undo the join and disconnect the other wires. Join the two ends of the external lead and test for continuity as before.

If no continuity is indicated, replace the flex from this point.

Should there be no join—i.e., the external and internal—leads are in one piece, except for the insertion of the switch, test between the plug or socket, as the case may be, and the plug at the end of the external portion. Test each wire of the lead with the switch turned off, if it has not previously been removed.

If no continuity is obtained there must be a break in the wire that is not connected to the switch. In this case, cut the wire beside the switch and test as previously explained as though there had been a join.

When replacing the flex, insulate the join with adhesive insulating tape. A joint of this description is all the better for being soldered, though this is not essential. Similarly, the connections to the switch should, for preference, be made by making little circles at the end of the wire and tinning these over with the soldering iron.

Now for the lower half of the lead.

This may be tested for continuity in the same way as the whole lead was tested—i.e., by joining the wires at the base of the handle. Replace if necessary by drawing the wire out from the bottom.

If the lead terminates in a fixture at the base of the handle, this may be removed in the same way as the top of the handle, by withdrawing the bolt. If it plugs into the motor casing, do not forget to leave a little slack to allow for the movement of the handle.

The next step is to test the switch. This may be done by touching the terminals with the tester wires with the switch turned on.

If there is no continuity, it will most likely be found that the fixed contacts are not quite pressing against the movable ones and this may be adjusted by a screwdriver. Should a great deal of trouble be experienced in obtaining continuity through the switch, the best course is to buy a new one from the makers.

Tracing Motor Troubles.—Having eliminated the flex and the switch, the next thing for attention is the motor.

The most common source of trouble here is the brushes, which may be removed by unscrewing the two little black knobs on each side of the motor, as seen in Fig. 5.

Make sure that the brushes are pressing firmly against the commutator (the metal split ring which can be seen through the brush holders). It may be that the brushes are worn too low or are sticking in their holders. When worn, replace them, and when they are sticking rub their sides on a small piece of emery cloth. Should this still not produce a satisfactory result, the tension on them may be increased by stretching the springs slightly.

If necessary, the next step is to uncover the motor. The removable part of the casing is usually held in position by means of a circle of bolts, and when these are removed the casing can be taken off.

Next undo the nut or other fastening from the centre of the fan, and the armature (the revolving part of the motor) can be withdrawn.

Look at the connections to the brush-holders and if these are in order, join the two external motor connections with a piece of wire and test for continuity across the two brush-holders.

If no faults are found, dust out the inside of the motor, clean the commutator with a piece of very fine sandpaper — not emery — and reassemble, making sure that all parts turn easily and that the fan is not catching on anything.

Should the motor still not run satisfactorily, or should it sometimes fail to start without the fan being first given a twist or should it get unduly hot, then the probability is that the trouble lies in the winding of the armature, and in this case again the motor will have to be returned for re-winding.

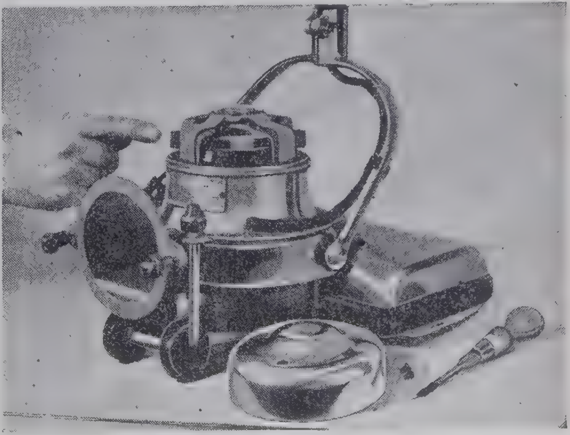


Fig. 5

This is a skilled operation calling for specialised knowledge, and is not one which can be easily undertaken by the amateur possessing no experience of this kind of work.

Another fault that is commonly found in vacuum cleaners, even when the motor is running well, is a lack of suction.

This may be caused by several things. The entrance to the bag may be choked with dust, in which case the cure is a good clean. There may be a puncture or a small tear in the bag. It is possible to patch a bag with an ordinary cycle tyre patch and rubber solution, but a more satisfactory repair can be achieved by the use of a piece of fine canvas and a solution, or specially prepared material sold for the purpose.

Another method is to use a marine glue and canvas which makes an exceedingly strong mend.

Hose Cleaners.—The repair and tracing of faults in a hose type of vacuum cleaner, where the motor is housed in a long metal container as in Fig. 6, is very similar to that of the detachable dust-bag type.

Test the flex as before, beginning by an examination of the plugs (in this case at both ends of the flex which is in one piece only).

The motor unit can, as a rule, be withdrawn (as far as the internal connections from the cleaner casing will allow) merely by undoing two clips on the outside of the case (see Fig. 6).

Test and examine the connections from the casting to the motor and then proceed as before with various tests of the motor itself.

In this type of cleaner, lack of suction may be caused by a leak in the hose. This may be patched by making a band of canvas and securing it by means of one of the solutions mentioned. Another method is to force a band of rubber, made out of a piece of cycle inner tube, over the puncture and bind it tightly round with insulating tape or cord.

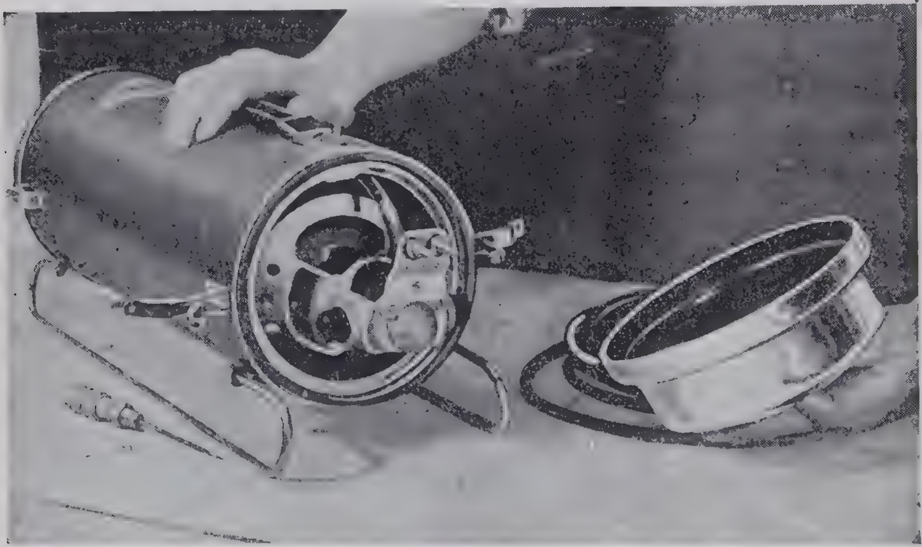


Fig. 6

The tracing of faults on practically all small motor driven appliances is very much the same, so if the procedure described here is carried out, electrical fans, hairdryers, and several other things that are used in the home, can be serviced.

The Washing Machine.—The same principle may be applied to the servicing of an electric washing machine. Instead of the fan that was removed to withdraw the motor in the vacuum cleaner, there will be a belt pulley.

The brushes will be under cover, owing to proximity to water, and it is essential to keep an electric motor dry. This cover usually takes the form of a band of steel, the two ends of which are bolted together. The switch will be larger than one on a vacuum cleaner and for this reason will probably be found easier to adjust.

Make sure that all covers and plugs are screwed tight, to exclude as much moisture as possible.

The actual gearing of the machine, which connects the motor to the rotating and the wringer rollers, is unlikely to require much attention, and, when it does, as a rule, the trouble does not require very much tracing and is usually cured merely by the renewal of the part.

Electric Fires.—Another very common electrical appliance that frequently requires attention, is the electric fire.

This may take one of several forms.

There is the bowl fire, which is generally of about 500 watts and has one cylindrical element.

Another type is the flat bar-element type, which consists of one, two or three 1,000-watt spirals, wound on a rectangular porcelain former. In the case of a two or three-bar type, a switch is usually incorporated for the purpose of switching off one bar. The diagram for the connections of this type of fire is shown in Fig. 7.

In order to trace a fault in an electric fire, first test the flex for continuity, from the connections on the element, or switch as the case may be, and then test the element in the same way.

Should the element be at fault, the break can usually be seen, and if it is near the end, the spiral can be stretched a little and reconnected to the terminal.

This repair may last a considerable time, but it is possible that the spiral may burn out again almost immediately. This is because the wire used in heating spirals forms a coating of oxidization very quickly when it gets hot for the first time, and this oxidization forms a sort of case hardening, which, when broken, never re-forms satisfactorily. It also forms an insulation between the turns of the spiral.

During the repair of a spiral, this coating of oxidization is nearly always damaged, and the consequence is, that the element seldom has the same lasting power as when new.

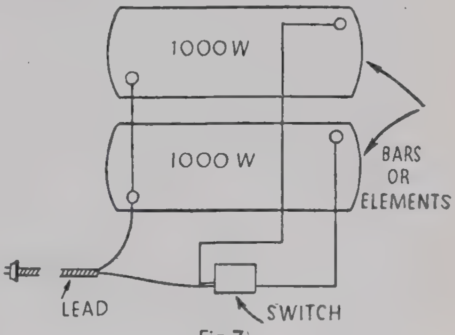


Fig. 7.

When reconnecting a spiral to the terminal, double the wire back for about an inch and then make a loop of the doubled wire. Also make sure that the turns of the spiral where it has been stretched or handled are not touching one another as the insulation that the oxidization provides has probably been damaged.

A fault that is often overlooked and which frequently causes the element to burn out is loose connections on the terminals of the spiral. Always make sure that these are as tight as possible.

Occasionally, in the case of a multi-bar fire, an obscure fault is caused by the mica insulation between the switch and the casing breaking down. The mica is sometimes replaceable, but more often it is necessary to replace the whole switch.

It will be noticed that no particular make of apparatus is specifically dealt with, owing to the fact that there are slight variations in construction in practically all different makes. However, if the principles outlined in this article are applied, with the addition of a certain amount of ingenuity, no great difficulty should be experienced with the servicing of apparatus of any make.

ELECTRIC LAMPSHADES

MAKING shades provides a most interesting and useful hobby, or even a profitable spare-time occupation. The amateur can tackle the most simple or the most elaborate of designs and there is practically no limit to the variety.

All the materials necessary are obtainable at a large number of the big stores, and they can be purchased in a variety of colours.

The Frame.—The first thing to obtain is the wire frame. This can either be bought ready made or constructed as described below. It is best to start with a comparatively simple shade, such as the one shown in Fig. 1, the frame of which is indicated in Fig. 2.

As will be seen from the illustration, the shade consists of four sides made up of shaped panels which can be of either parchment or some other suitable material of the maker's own choice.

To construct this frame a length of stout tinned-iron wire, a soldering iron, solder and flux are necessary.

First cut the wire, with the aid of a pair of cutting pliers, to the correct lengths, namely, one piece 36 in. long and another 12 in. and four pieces each 7 in. long. Mark off on the longest piece a distance of 4½ in. then three points 9 in. apart. Bend the wire at each of these points, to a right-angle, thus forming a square having one side divided at the centre. Do the same with the 12 in. piece; the distances in this case being 1½ in. and 3 in.

Soldering the Frame.—We now have two squares and four straight pieces of wire, and it now remains to solder these parts together. To do this first clean all the ends of the wires with emery cloth or by scraping with a knife. To save time, this operation can be done while the soldering iron is getting hot.

Now tin the ends of the wires by smearing the end to be "tinned" with a thin coating of flux. A semi-solid flux sold in tins is excellent for the purpose as it is clean and easy to use and does not corrode the wire.

Then apply the hot soldering iron (with some solder on it, of course) all round the end of the wire for a distance up from the top of about ¼ in. The end of the wire will now be covered with a thin layer of solder.

To make the solder stay on the iron, the heated iron (not red hot) must also be tinned by cleaning the copper end with a file, then smearing it with flux and rubbing it on the solder. It will be found that a small quantity of solder will remain on the iron until it requires cleaning again.

Place the ends of the wire of one of the squares together, tip to tip, and apply the hot iron loaded with solder under the two of them, thus soldering them together. As it may prove awkward to keep the ends of the wire butted together during the soldering process, the wire can be tacked down to a board in the manner shown in Fig. 3.

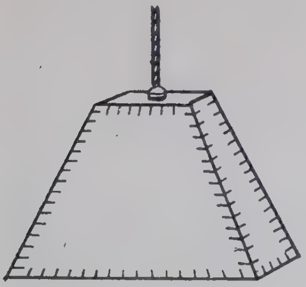


Fig. 1

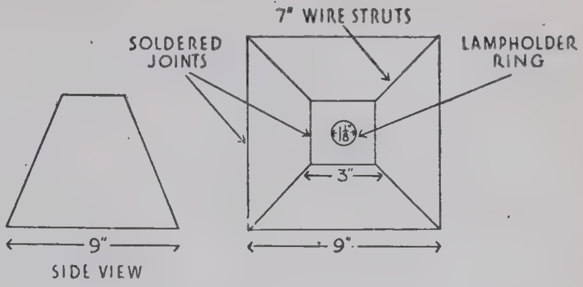


Fig. 2

Repeat the process with the other square.

Now take the large square and at each corner solder one of the straight pieces of wire and then solder the other square to the free ends of these pieces.

A Ring for Fitting to the Lampholder.—Make a plain circle of wire of 1⅛ in. internal diameter and on this solder two pieces of wire sufficiently long to go from the ring to the opposite corners. Solder this to the top square and thus complete the frame.

Covering the Frame.—The next step is to cover the frame with tape of similar colour to that of the material of which the panels are to be made. This is quite easy to do, the tape being bound round as illustrated in Fig. 4 and a few stitches being put in at either end to hold it in position.

Now cut out the panels.

First mark out the outlines faintly in pencil and then cut along them. The best method is to lay a metal straightedge or rule along the line to be cut and run a very sharp penknife along the guide. Even better results can be obtained by using an old type of hollow-ground razor. This method is to be preferred to using scissors, but if great care is taken there is no reason why scissors should not be employed.

Cut out four panels of the same measurement as the sides of the frame. These panels must now have holes punched along the sides for the tape or cord to pass through which will secure them in position on the frame.

First punch a small hole ¼ in. from each corner and ⅛ in. from the edge, in the top, bottom and sides. Now down the right-hand side, looking at the panel from the front and starting at a point ¾ in. down from the first hole punch a line of holes ½ in. apart. Do the same down the left-hand side, but start from a point ¼ in. down from the first hole. Thus when the adjacent panels are bound together the tape will slant towards the right.

The holes along the top and bottom of the panels should be punched at a distance of ¼ in. apart.

The panels can now be secured in position by passing the tape through the holes.

The material used for securing the panels need not, of course, be the very narrow tape that is generally used. Silk cord, leather thong or any such thing can be used to suit the maker's taste.

The best method of securing the tape is to pass it through the first and last holes twice instead of once and then stitching it to the binding on the frame.

Other Shapes.—Having made a simple shade on the lines just mentioned the maker will perhaps like to try his hand at making one or two more elaborate types as suggested and described below. No dimensions, however, will be given as, of course, the maker must decide these to suit his own requirements.

The frame, Fig. 5, consists of two semi-circular diagonals of wire at right-angles to each other at the centre. These diagonals in reality consist of four pieces of wire, the top of each piece being soldered to a ring for fitting on to a lampholder as already described. The bottom support is simply a length of tinned wire carefully bent to form a circle of the desired size, the ends being fixed together by solder.

This frame may be strengthened if desired by the addition of curved struts from the top ring to the lower one, as indicated by the dotted lines.

The panels should be inserted in the manner already described after the frame has been bound and the fringe added.

A word or two should be mentioned here on the cutting of the panels.

This is not quite such a simple matter as that of the plain flat shade already described as the dimensions cannot be simply measured and then transferred to the materials.

The best way is to obtain a piece of thin paper and place it in the position which the panel will eventually occupy, and then pencil round the frame. The paper can then be cut along these pencil marks, so forming a very convenient pattern.

Fig. 6 shows a very pretty shade which is usually rather small. This shade consists of six panels arranged in a sort of flower-shaped pattern. Such a shade measuring 9 in. in diameter at the bottom would do admirably for a standard lamp for a table or desk.

A good colour arrangement in this type of shade is to have alternate panels of different colours, preferably of pastel hues.

Another very simple shade is shown in Fig. 7. It consists essentially of two rings of wire, the top one being smaller than the bottom one. The covering material is pleated crepe paper and is stitched to the frames with silk of the same colour as the paper. Vertical supports are unnecessary on a small shade of this description, but if a large one is required it may be an advantage to incorporate five or six such supports. The top ring must, of course, be fitted with a small ring $1\frac{1}{8}$ in. in diameter to take a lampholder.

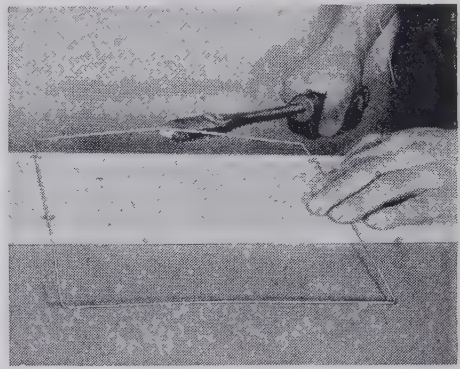


Fig. 3

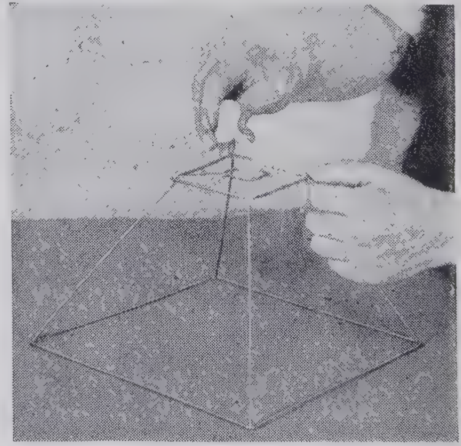


Fig. 4

Fig. 8 shows an easily constructed electric lampshade suitable for hanging on the headrail of a bedstead. It will be seen that a $1\frac{1}{8}$ in. diameter hole is provided in the side for accommodating a cord grip key-switch lampholder to enable the lamp to be switched off from a convenient position.

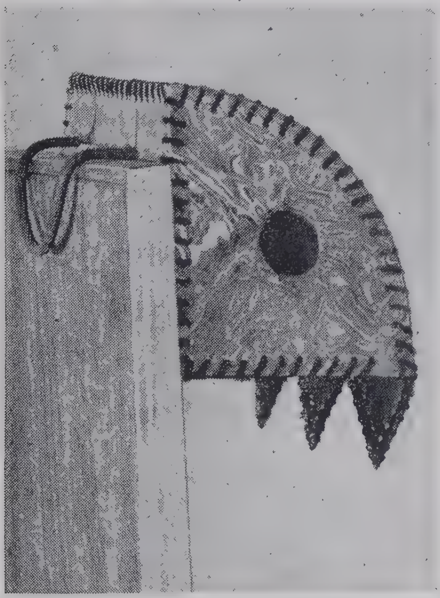


Fig. 8

The complete shade consists of six separate panels, three in the front, two forming the sides and one at the back.

A wire bent to form a hook is provided at the back for hanging purposes. The hook can be enclosed in a thin rubber tube or bound round with tape to prevent scratching the surface of the bedrail.

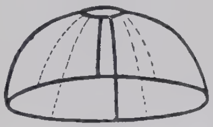


Fig. 5

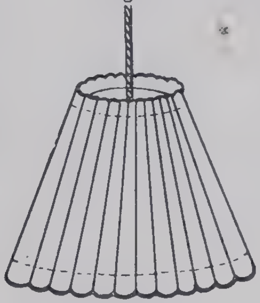


Fig. 7

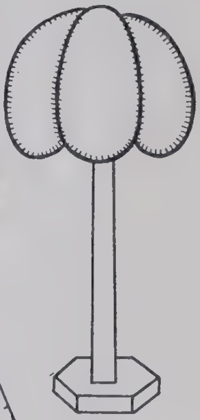


Fig.

A quarter of an hour spent in studying the designs of electric lampshades in a catalogue of electrical goods will give the amateur some valuable ideas for constructing many more lampshades of pleasing and original pattern.

A BATTERY-OPERATED BED LIGHT

The battery-operated bed light here described is a device which should appeal to readers who have no electric light installed in their homes.

Fig. 1 shows an illustration of the completed article which consists of a piece of hardwood, although plywood or a faultless piece of deal could also be used, upon which is mounted a metal container for housing the battery, a miniature holder and flashlamp bulb, a switch for operating the light, while two metal clips keep the fitting in position on the bed rail.

Referring to Figs. 2, 3 and 4 which give constructional details, it will be seen that the base-board measures 6 in. long, $3\frac{3}{4}$ in. wide × $\frac{3}{8}$ in. thick and the metal container 3 in. in width, $3\frac{1}{4}$ in. long and $1\frac{3}{8}$ in. deep, which is of sufficient size to house a two-cell cycle lamp refill dry battery of the normal standard size. The lampholder is of the miniature screw-in type, and the lamp, whose voltage is 2.5 volts, is of the same kind as that used in an electric torch of the type which uses a two-cell battery.

Although the bed light is intended primarily for intermittent lighting—that is to say, for switching on for a minute or two at a time—the battery is capable of running the lamp for several hours continuously and the light will be powerful enough for the user to read by it provided the lamp is not too far away.

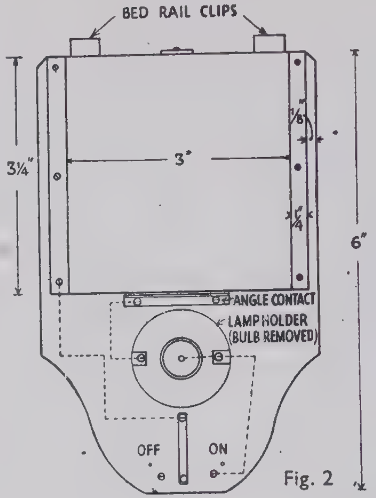


Fig. 2

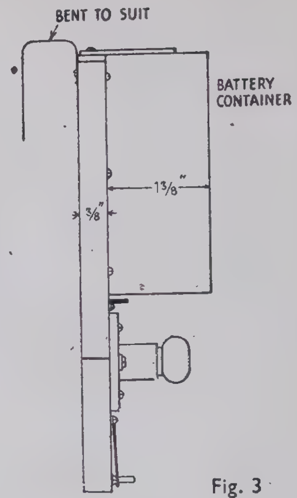


Fig. 3

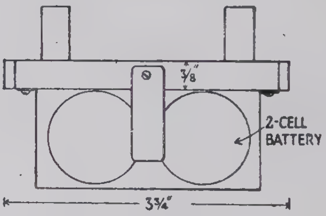


Fig. 4

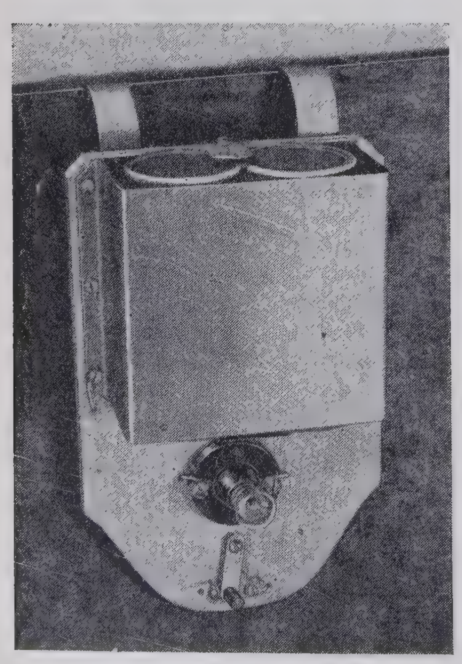


Fig. 1

Start construction by making the base. To give a neat appearance the top corners should be rounded or cut off square, while the bottom will look well if shaped as shown in Fig. 2. As the wood is comparatively thin a fretsaw may be used for cutting the shape, or if this tool is not available a pad saw can be employed for roughing out and then the work smoothed with a spokeshave and glass-paper.

A piece of tinplate from a tobacco tin—or, better still, a piece of thin sheet brass, as that metal does not rust—should now be cut to a length of about 8 in. and marked out as shown in Fig. 5. This measurement leaves a surplus at each end which facilitates bending, and the metal can be removed afterwards.

Bending Tinplate.—The best way to bend the metal is to begin with the ends. Sandwich the metal between two squared pieces of wood so that the line of bending coincides with the top edges of the wood. Place the whole in a vice and force the projecting length down with the fingers, finally tapping it with a hammer until it is square. Then fashion the opposite end. The remainder of the bending can be done by forcing the metal down over the edge of a square block of wood. Drill three small holes in each fixing flange to take the screws for fastening the battery container to the base.

The switch consists of a piece of springy brass 1 in. long × $\frac{3}{16}$ in. wide, details of this fitment are shown in Figs. 2 and 3.

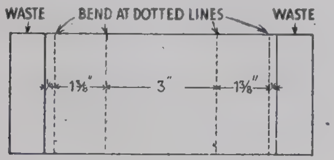


Fig. 5

A hole to clear a No. 3 ¼ in. diameter brass round-headed screw is drilled ⅛ in. from each end and a screw driven from the back into a small piece of hardwood to form the handle. As the piece of brass forming the switch is small, it will be found easier to do the drilling before cutting to shape. When cut, just snip off the sharp corners to give it a finish.

The clips for fixing the bed light to the head of the bed are cut 2 in. long × ⅜ in. wide and are not bent to shape until after assembling.

Two more pieces of brass must be cut, one for the contact immediately under the container, upon which the battery contact rests, and the other for keeping the battery in position at the top. The lower one is in the form of a small bracket and is shown clearly in Figs. 2 and 3, while the upper one is merely a strip which presses on the top of the battery.

Concealing the Wires.—In order to eliminate unsightly wires on the front of the base, the connecting wires, consisting of a few inches of 22 gauge double cotton-covered instrument wire, pass through small holes drilled in the wood and are sunk in shallow channels, easily cut with a penknife, at the back. The connections are simple and are indicated by the dotted lines in Fig. 2. The holes may be bored and the channels cut after assembling.

The first step in assembling consists of fixing the battery container to the base by means of half a dozen No. 3 round-headed brass screws ¼ in. long. The top edges are kept flush with the top of the base and the edges of the fixing flanges ⅛ in. from the side edges. The contact bracket is fixed by the same kind of screw immediately underneath the battery container; the lampholder about ¼ in. below and the switch underneath the lampholder, as shown.

A brass screw ½ in. long should be used for fixing the switch arm to the base and a couple of small washers inserted between the head of the screw and the wood; the bared end of the connecting wire being inserted between the washers. This also applies to the contact screw on the right-hand side. The opposite screw is used merely for keeping the switch on the "off" position.

Having connected the wires and driven in a short panel pin on each side of the switch arm to prevent it from moving too far, the whole of the back can be covered by pasting on a piece of thick brown paper.

The constructional work is complete when the battery clip at the top has been fixed and the two hooks at the back screwed and bent to suit the shape of the bed rail.

Before inserting the battery into the container the contact consisting of a thin piece of brass between the two cells should be bent forward a trifle to ensure that it presses against and makes good metallic contact with the inside of the container. If this is not done, intermittent light or no light at all is likely to result when the switch is moved to the on position.

The battery is inserted upside down—that is, with the top contact pressing against the angle contact fixed to the base—the clip at the top then being adjusted to keep the battery pressed down.

Where a small accumulator of the wireless type is available, the bed light could be modified to suit, no battery container or bottom contact bracket being necessary. These parts may be substituted by two terminals for securing the ends of the accumulator connecting leads.

The initial outlay for an accumulator is, of course, greater than for a refill battery. As against this, however, a fully-charged one having a capacity of 20 amp. hours would give a continuous light for approximately sixty hours, assuming that a 2-volt .3 amp. bulb be used.

Recharging such an accumulator is a fairly quick process.

A substantial wooden case should be made for holding the accumulator which could stand underneath the bed.

MAKING AND FITTING A BURGLAR ALARM

There are several types of burglar alarms which are simple to construct and they fall into two classes—the open and the closed circuit. The one described below is an open circuit alarm and the cost of upkeep is negligible.

It can be fitted to almost any type of window, fan-light or door and is very reliable if it is kept in good order.

It consists chiefly of two strips of metal, one thin and springy and the other thicker and stiff.

The action of opening the door or window causes the thin strip to spring into contact with the other.

The best metal is brass, which is not only easy to work but is also less likely than most other metals to corrode with exposure.

First Steps.—Obtain two strips of brass about 4 in. long and ½ in. wide. One should be about $\frac{1}{16}$ in. thick and the other of the type of which the connecting strips of torch batteries are made—that is, thin and springy.

These two strips should be drilled in the way shown in Fig. 1.

The holes should be large enough to take a ⅛ in. thick screw and those in the thicker strip should be countersunk, so that, when the alarm contact is constructed, there is a flat surface.

This is important, otherwise it will be difficult to fit the alarm and allow the window to be shut.

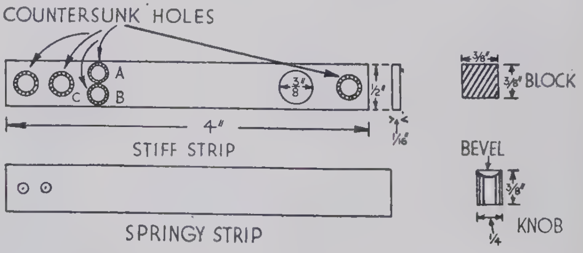


Fig. 1

It will be noticed that in Fig. 1 the thicker strip has a large hole at one end. This should be made at least ⅜ in. in diameter.

As well as being drilled, the thin strip can, at this stage, also be bent to the shape shown in Fig. 2. It is easy to do this with a pair of pliers.

Then obtain a little cubical block of some insulating material and a little cylindrical-shaped piece of the same material.

The Mounting Block.—A hard fibre material is ideal, as it will not swell with damp. But a hardwood like oak may be used satisfactorily.

The length of each side of the block should be about ⅜ in.

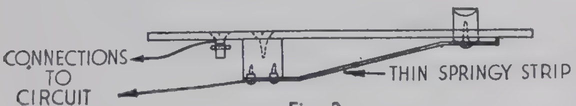


Fig. 2

The cylindrical piece will be subject to the opening and shutting movement of the window, and should be bevelled off on one side as shown in Fig. 1. It should be about ⅜ in. long and not more than a ¼ in. in diameter.

The complete contact is illustrated in Fig. 3. The block is first mounted on the thicker strip with two small counter-sunk brass screws (⅜ in. by No. 4 will be the size) through holes A and B in Fig. 1. The thin strip is then screwed to the block through the two holes at one end, using round-headed screws. Under one of these screws it will be found advisable to put a small washer, as one of the connecting wires will be placed here, using the screw as a terminal. The other connecting wire will go under a nut on a countersunk bolt through the hole C in Fig. 1.

The next step is to fit the cylindrical knob to the other end of the thin strip, also by means of a wood screw. This knob should have its bevelled edge facing the oncoming portion of the window, so that the window, in closing, does not first strike a sharp corner. If this is not done, the knob may be pushed off instead of merely being depressed.

Fixing to the Window.—It is fitted to a window as shown in Fig. 4. It will be noticed that the contact, when assembled, is not at any point thicker or deeper than ¼ in. It will not, therefore, be necessary to groove out the window frame to a depth greater than ⅝ in.

Mark out the size of the front (the thicker strip on the frame) and measure in towards the centre of the rectangle so marked to a distance of ⅜ in. This will give a second rectangle inside the first. The second rectangle, assuming that the first is 4×½ in., will be 3¼×½ in.

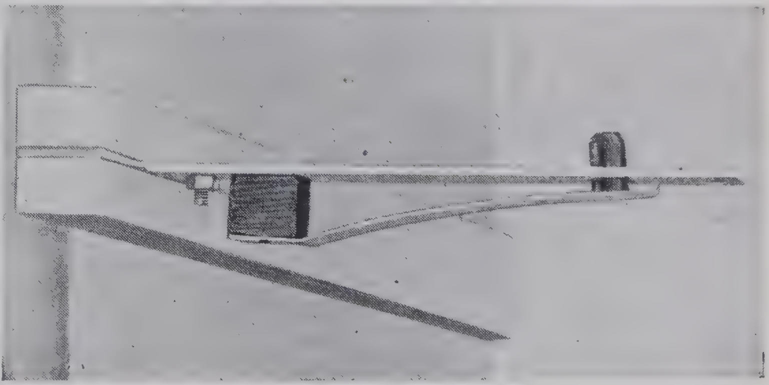


Fig. 3

Make a groove in the window frame about ⅝ in. deep and within the limits of the smaller rectangle.

We now have at each end of the large rectangle a small section $\frac{3}{8} \times \frac{1}{2}$ in. which is so far untouched.

These ends should be grooved out to a depth of exactly $\frac{1}{16}$ in. The complete contact should now fit flush with the face of the frame and, when the wires have been connected, can be screwed in position with countersunk wood screws.

Before finally securing, make a little slot in the window frame from the inside edge of the frame to the edge of the deep groove at the block end of the contact.

This should be deep enough to contain the wires and to allow them to enter under the front strip.

The wiring diagram is shown in Fig. 5. It will be noticed that a switch has been incorporated. This is so that the window can be opened legitimately without the alarm sounding.

Current Supply.—Two low resistance dry bell cells have been used. There are alternative methods of supplying current besides the use of cells, which deteriorate with standing and have to be replaced.

If the premises have an alternating current lighting supply, use a bell transformer, which supplies a current for working an electric bell at a voltage which can be either 4, 6 or 8 volts broken down from the main's supply.

If a transformer is used, it is best to obtain an A.C. bell, although an ordinary bell will work quite well provided magnet coils only be used.

Another method is to use a Leclanche cell, which can be obtained cheaply from an electrical store. For this it is necessary to make in the jar a solution of sal ammoniac in water. Sal ammoniac crystals can generally be bought from the same electrical shop where you purchase the cells. Warm the water slightly and dissolve crystals in it until no more will dissolve.

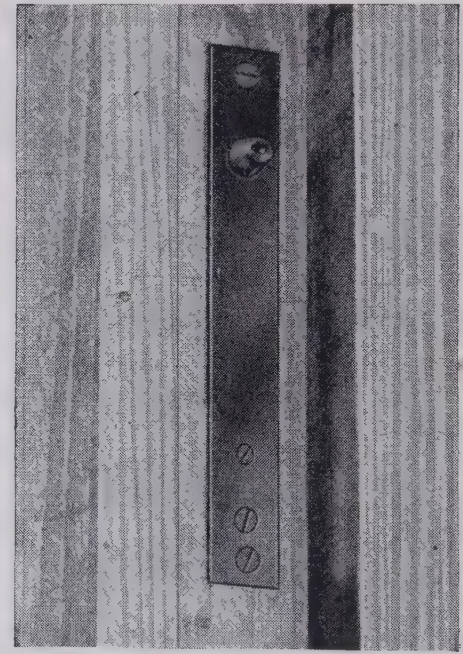


Fig. 4

You will then have a saturated solution in which the rod and porous pot must be immersed. The rod will have a wire for attaching to one wire of the circuit and the pot will have a terminal for the other. It is advisable to use at least three of these cells as their individual voltage is only 1.5 volts.

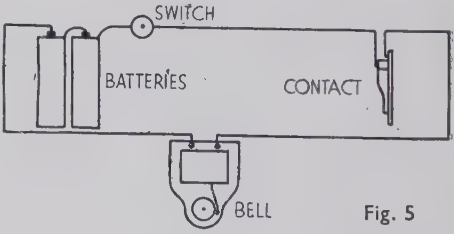


Fig. 5

The Leclanche cell has the advantage of not wearing out when not in use, but it requires periodical attention as the solution evaporates and requires renewing, and the zinc rod corrodes and is gradually eaten away.

Dry cells, on the other hand, are more

easily renewed, and are preferable to those who do not mind the extra cost.

The use of accumulators is not practicable as long periods of idleness are ruinous to them.

Invisible Wiring.—Wiring should be carried out in good rubber insulated bell wire, and should be kept out of sight and reach of the window.

The contact itself is inaccessible until the window is actually opened, but if the wire is first cut—say, through a broken pane—the window can be opened without operating the bell.

Keep the wire on the top of the picture rail and bring it down from the window frame in the corner.

The switch and battery should also be kept as far from the window as possible—in another room, in a cupboard or some other inaccessible place.

The alarm can be extended to any number of windows or doors by taking a wire from each of the connections on the contact to the next contact.

The alarm should be tested from time to time to ensure that it is ready for infrequent emergency.

The battery should be examined periodically and the terminals kept clean.

It is important to clean the spring contact every now and again. Otherwise it may fail to give alarm at the right moment.

USEFUL ELECTRICAL DEVICES

ONE of the regulations of most electricity companies is that cookers should be provided with a main-switch which incorporates a pilot light. This pilot light is of very low consumption and gives a dull red glow, and the object of it is to ensure proper warning that the current has not been turned off. But there are many electrical appliances which provide no visible indication of whether they are turned on or off and which are not normally fitted with a pilot light

Pilot Lamp.—The first of our devices is a pilot lamp, fitted in conjunction with the plug switch from which these appliances are worked.

The first thing to do is to obtain the required materials. These are; a small 5 watt neon lamp, with an ordinary bayonet cap (these lamps are made by all the big lamp manufacturers and can be obtained from any electrical store, a batten holder (which is a lampholder made for screwing on to a flat surface) and a "two-way" switch block (which is a block of rectangular shape and is big enough to hold two switches, although in this case it will be required to hold the switch plug and the batten holder).

Having acquired the materials, the original switch plug must now be taken off, not forgetting to turn off the power first.

Now place the switch plug and the batten holder on the new block side by side, and mark their positions and also the positions in which the holes will have to be drilled behind the three terminals of the switch plug.

Practically all switch plugs are provided with three terminals although, except for less usual purposes, such as this, only two of them are used. The use of the third terminal will be explained later.

The arrangement of these three terminals is shown in the illustration of a typical switch plug in Fig. 1. Drill holes at these points and one fairly large one (about ½ in.) in the centre behind the batten holder. Now drill two fixing holes in the block, one behind each fitting, making sure that they will not be in the way of the screws that will secure the fittings to the block. These holes should be countersunk. The arrangement is shown in Fig. 2.

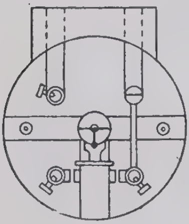


Fig. 1

Next take a piece of wire from hole 3 of the plug to the hole of the batten holder and a piece from hole 1 to the batten holder. The wire will only carry a very small current and so it will not have to be of a very heavy gauge, but it is advisable to use V.I.R. (vulcanised india-rubber) or else "tough rubber," in preference to flex, which is not provided with sufficiently hardy insulation.

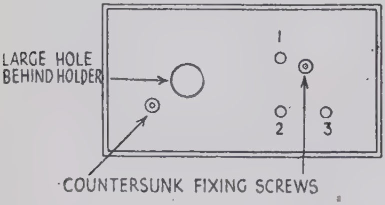


Fig. 2

The position of the fixing holes should now be marked on the wall and the wall plugged if necessary.

Push the positive or feed (red) wire or wires through hole 2 and the return wire (black) through hole 1, and screw the block in position. Push the wires through their appropriate terminals and mount the plug and batten holder.

The neon lamp, of course, fits into the batten holder and it can then be seen that the indication given by it, serves a double purpose, in that it not only indicates when current is passing through any appliance that is plugged into the switch plug, but also shows whether the plug itself is left switched on when not in use.

If the positions of the terminals of the plug to be used do not coincide with the arrangement in Figs. 1 and 2 the arrangement for any particular plug (which, however, must have three terminals) can be worked out quite easily from the wiring diagram in Fig. 3B.

Fig. 3A shows the complete device.

An Automatic Cupboard Light.—Another very useful device for turning on the light in a cupboard or larder as the door is opened.

A switch for this purpose can be bought ready made, but for anybody of an ingenious frame of mind who is interested in making things for himself, a fairly simple method of adapting an ordinary tumbler switch for this purpose, is described below.

The first thing to do is to remove the switch (which must be situated if it is to be adapted for our purpose, on the wall inside the cupboard near the door post). It should then be turned round and replaced so that the knob works backwards and forwards instead of up and down, as is normal. The knob should be pointing towards the door when the switch is turned on and away from it when turned off.

We shall now require a piece of round brass rod, two or three inches longer than the distance between the face of the back of the door when it is shut and the knob of the switch when it is in the off position. The rod should be of about ¼ in. diameter.

We shall also require about a foot of strip brass about ⅜ in. to ½ in. wide × $\frac{1}{16}$ in. thick.

Round off the ends of the rod with a file and then bend it so that when one end is touching the door and the rod rests against the door post at the other end it rests against the cover of the switch, or in other words if one end rests on the top of the switch knob the other end will be about ¼ in. from the face of the door post.

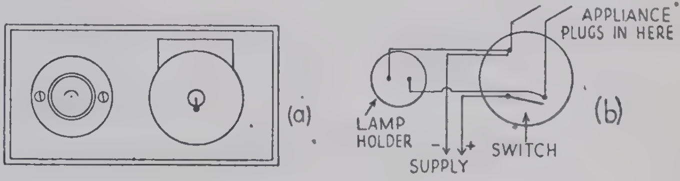


Fig. 3

The manner in which the rod is "set" or bent is made clearer by a glance at Fig. 4 which shows the rod held in this position, looking at it from the top.

Holding it in this position with the switch off and the end resting against the closed door, make a mark on the rod where it touches the switch knob. Drill a hole in the mark, just a shade larger in diameter than that of the shank of the switch knob and file the spherical part of the knob so that it is of the same diameter as the shank.

Now with the shank fitting in the hole and the straight sections of the rod parallel with the wall, measure the exact distance between the rod and the face of the door post at one end and the face of the wall at the other, taking the measurement from the centre of the diameter of the rod in each case.

Using the strip brass, make two brass staples of the shape shown in Fig. 4B, each having the distance from the base to the centre of the circle, the same as one of the measurements we have just found, thus providing a simple form of guide for each end of the rod. In each of the feet of these guides drill a hole for the fixing screws to pass through.

If the wall has a very soft surface, it may be found best to mount the guide furthermost from the door, on a thin block of wood, and if this is done the height of the guide when it is made must be measured accordingly.

A spring is the only other thing required. Its purpose is to pull the switch into the on position, so that it will have to be fairly strong although the ordinary tumbler switch does not require as much pressure as one might imagine.

The length should be just under the distance of the centre portion of the bent rod, although the actual length can be adjusted afterwards to give the required tension.

A small screw-hook should be screwed into the back of the door post on the same level as the rod and the end of the spring can be bent into the shape of a loop to go over the hook.

A very small hole should now be drilled in the middle of the centre portion of the rod and the other end of the spring should be passed through it, and then doubled back on itself and twisted round, in order to make it perfectly secure.

The whole can now be assembled and should resemble the illustration in Fig. 5 which is a plan viewed from the top.

It will be seen that as the door shuts, it forces the switch to the off position and as it opens the spring pulls the switch on. Thus it is impossible to leave the light turned on in the cupboard and even if the spring becomes loose or breaks (which is the most likely fault to develop), the door cannot be shut without the light being turned off.

A Bureau Light.—A light actually fixed inside the bureau eliminates the necessity for having an ordinary standard lamp balanced precariously on top of a bureau.

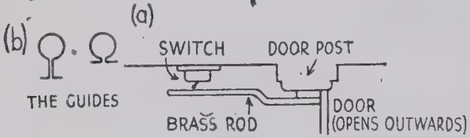


Fig. 4

This can be very easily accomplished by drilling a hole through the back of the bureau and pushing through a good length of flex.

Connect a batten holder on to the end of this flex and secure the batten holder inside one of the pigeon holes or at the most convenient place. Staple the flex down at the bottom of the back of the bureau by means of insulated staples and on the other end put the plug, for putting into the switch plug from which the supply is to be taken.

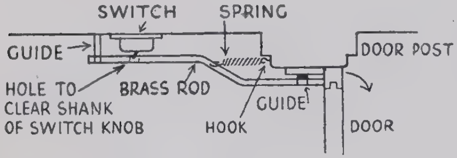


Fig. 5

That is the light in its simplest form, but it can be developed and improved upon according to the taste or requirements of the user. For instance, instead of one, two lights can be fitted, one at each side of the bureau, by simply looping another piece of flex from the first batten holder, and connecting and fixing another holder at the other end.

Then again it is usually found more convenient to have a switch within easy reach of the person working at the bureau and this can be fitted inside the bureau on one of the sides or underneath the top.

The connections to the switch can be made by cutting one strand of flex and just making a small groove so that the wires will fit neatly underneath the switch.

The same method can be adopted for fitting a light inside a gramophone cabinet and many other similar places. It can be seen also that the fitting of the automatic switch already described, would not present a very great problem in a position of this sort.

Bedroom Clock Light.—Another useful place to have a light is over a bedroom clock, and here again the best thing to do is to use a batten holder.

If the clock has a wooden case, the holder can be mounted on a little strip of wood, secured to the back of the clock, the wires being brought through holes drilled in the wood.

If the clock has a metal case, it is quite a simple matter to construct a neat stand, consisting merely of a base and a narrow back which can if desired, be patterned with a fretsaw.

A small 5 watt neon lamp forms a very good night-light and the consumption is very small indeed. It will in fact take 200 hours to burn one unit, and is, therefore, a very economical form of lighting.

REPAIRING ELECTRIC ACCUMULATORS

It is not intended in this article to give a detailed account of the theory of accumulators, but it may be mentioned here that the lead cell consists of lead plates, contained usually in a glass, celluloid or other container of acid-resisting material.

The lead plates are divided into two

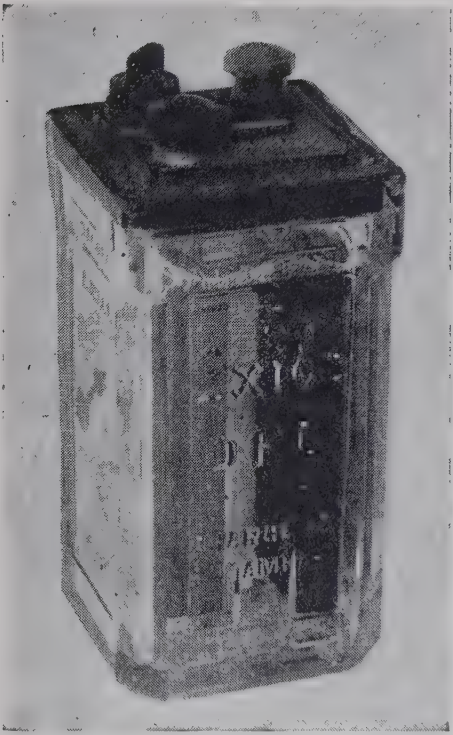


Fig. 1

sets. In the case of the two plate type as represented in Fig. 1 the dark coloured one (chocolate) is the positive plate and the other (grey) is the negative.

In the multi-plate type (Fig. 2) there is a set of positive plates, all joined together and a set of negative plates, also joined together. The electrolyte, or liquid in this case, is dilute sulphuric acid.

Short Circuits.—In all accumulators one of the most common sources of trouble is a short circuit across the two sets of plates. This, as a rule, is caused by the active material of the plates dropping out and falling to the bottom of the container, thus forming a layer of conducting material, which gradually gets thicker and thicker until it reaches the level of the bottom of the plates as clearly seen in Fig. 3 so forming a short circuit.

There are several ways of dealing with this. First the cell can be washed out. This is done by emptying out the acid and refilling the cell with distilled water, or rain water.

The use of ordinary tap water should be avoided unless it is absolutely impossible to obtain anything else, as it may contain iron and other impurities, detrimental to the cell.

When almost filled, the stopper is replaced in the cell and then, over a sink, the cell given a good shake, upside down and emptied again. This procedure is repeated several times, until the bottom of the cell is perfectly clear.

It should then be rinsed out with sulphuric acid of about 1.250 specific gravity (Sp. G.), filled with acid of just over 1.200, and recharged slowly.

This method is frequently used in

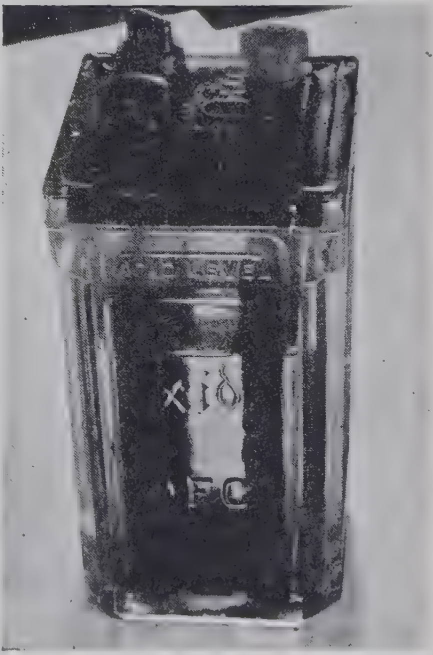


Fig. 2

wireless shops, and accumulator charging depots of that description, but it has several disadvantages. It does not allow the loosened paste to be scraped off the plates. Furthermore the shaking which the cell receives loosens the paste still more, so that before very long the cell requires cleaning again.

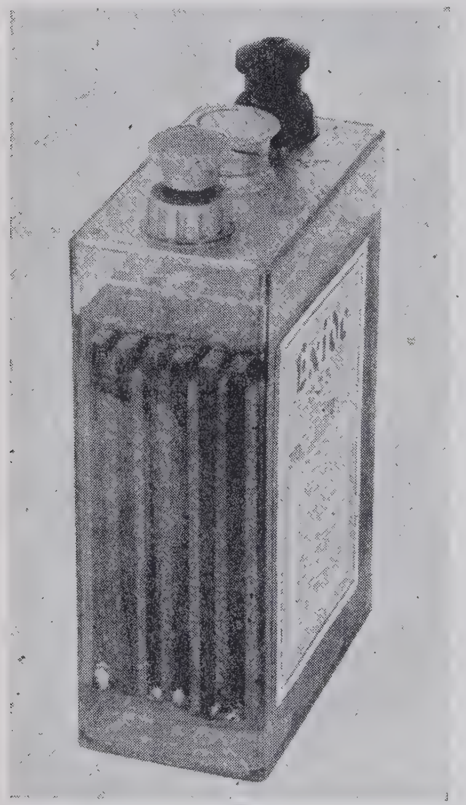


Fig. 3

A much better method is to withdraw the plates from the casing. In some small types of cells the casing is a glass jar.

The plates are secured at the top to a small sheet of ebonite, which is held in the top of the jar by bitumen (a form of pitch). This is illustrated in Fig. 4. To remove the plates the bitumen must be loosened from the jar.

This may be done by inserting and running a hot knife round the edge between the bitumen and the jar, thus separating one from the other. Then, holding the jar with one hand, pull on the terminal of the cell with the other and it will be found that the plates, complete with the ebonite top, can be withdrawn from the jar.

Another and possibly a better way, if a small gas or spirit blow-pipe is available, is to melt all the bitumen and then quickly withdraw the plates. This method must, however, be used with the greatest of care in order to avoid cracking the jar.

Note here that it is extremely inadvisable to apply heat to any cell without first emptying out the acid, as the gas given off by the electrolyte of a fully charged cell is explosive.

A very gentle flame must be used and the cell must be kept constantly turning round, so that the flame never remains in the same spot for more than a few seconds at a time. Of course, this method must on no account be applied to a cell in a celluloid or other such plastic casing.

The plates can then be thoroughly washed in distilled water and the loose paste gently scraped off with a knife.

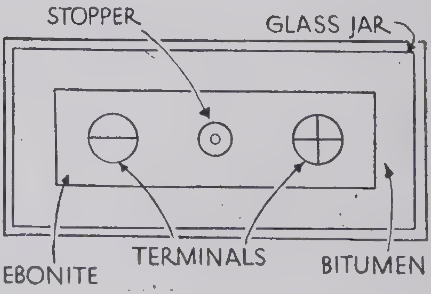


Fig. 4

The jar must also be thoroughly cleaned out and care must be taken to see that it is fairly well dried inside and out afterwards.

To Replace the Plates, first remove by means of a knife or a screwdriver all the bitumen from the ebonite.

Place the plates and the ebonite back in the jar and lay one or two thin, narrow strips of bitumen around the edge of the trough, which will have been formed by the removal of the bitumen. This is to prevent the melted bitumen which will be poured back from running down inside the jar, through the slight gap between the edge of the ebonite and the sides of the jar.

Melt the bitumen in an old tin or some container of a similar description (an old saucepan does very well) over a very low flame. When this is melted it can be carefully poured all round the trough, and when it is hard the cell is ready for refilling with acid and then charging.

Replating.—Sometimes the plates become so poor that they are practically useless, and it is necessary either to procure a new cell or to replate the old one.

In the better types of cell the ebonite is moulded round the post of the plate, and in this case the best thing to do is to procure a set of plates with the ebonite top and put this in a jar in the manner already described.

Where the plate posts are threaded below the terminal thread and the plates are merely held in position by means of tapped nuts or washers, as indicated in Fig. 5, replating is a rather more simple matter.

When replating this type of accumulator, remember always to replace all the original washers, otherwise the acid will creep up and corrode the terminals.

Accumulator Terminals are frequently a source of trouble. In order to avoid corrosion they should be kept well coated with vaseline. Should they become so badly corroded that they cannot be loosened by ordinary means, heating or saturating them with paraffin oil will generally have the desired effect.

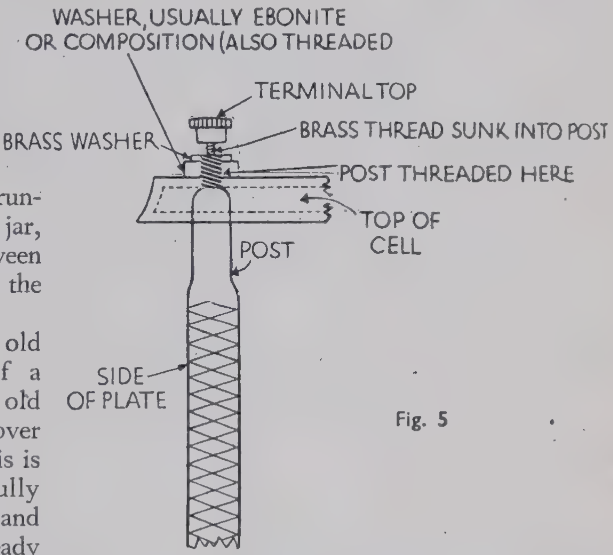

WASHER, USUALLY EBONITE OR COMPOSITION (ALSO THREADED
TERMINAL TOP
BRASS THREAD SUNK INTO POST
BRASS WASHER
POST THREADED HERE
TOP OF CELL
POST
SIDE OF PLATE

Fig. 5

In some cases the terminals become so corroded that they completely break off. If this occurs the terminal post can be redrilled and tapped.

To do this, file the top of the post flat and then centre punch that portion of the terminal which will still be in the post. Drill a hole of slightly larger diameter than the original one and then thread it with the appropriate tap. This must be done very carefully and gently as, of course, lead is very soft.

Next, screw in a short piece of threaded brass rod (this can be bought in short lengths with a thread to suit the particular tap used) leaving about $\frac{1}{2}$ in. projecting above the terminal post.

Screw on to this a brass washer and tighten it down on to the post. Finally, fit a nut or a terminal top and the terminal is complete, Fig. 6.

The Celluloid Container, though

lighter than a glass one, has the disadvantage of being very easily cracked.

If the plates swell at all, there comes a time when the celluloid cannot stretch or distend any more, and it will then crack—usually on the corner.

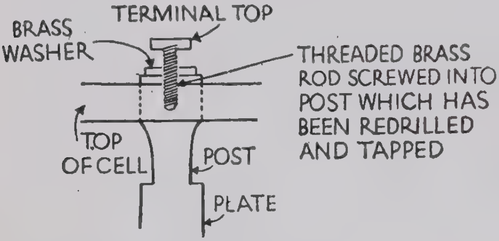
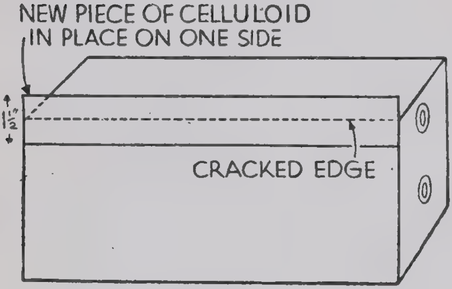

TERMINAL TOP
BRASS WASHER
THREADED BRASS ROD SCREWED INTO POST WHICH HAS BEEN REDRILLED AND TAPPED
TOP OF CELL
POST
PLATE

Fig. 6



CELLULOID CASED CELL
Fig. 7

The best way to repair a crack of this description is to cement another piece of celluloid by means of celluloid cement, which can be obtained at most accumulator charging stations.

First cut a piece of celluloid of the same length as the height of the cell and about 1½ in. wide. Soak this for a short while in the cement to soften it a little. Roughen the sides and corner of the cell where the patch is to be, using a piece of emery cloth or a small file.

Place the piece of celluloid along the side of the cell, having first smeared both thinly with a coat of cement (see Fig. 7).

The patch and the cell should now be clamped together by means of a wooden clamp or in a vice until it is dry.

Then fold the celluloid over the corner smear with cement and clamp as before.

Do not attempt to commence the second part of the job until the first part is quite dry, as this is never satisfactory.

Patching a hole on a flat surface of the cell is comparatively simple, but even in this case it is advisable to roughen the surface as before and to apply slight pressure to the patch until the cement begins to harden.

NOTES AND HINTS ON RADIO

To overhaul a receiving set and its appurtenances is not such a complicated matter as some people imagine it to be.

If the receiver is connected to an outside aerial it is advisable to go over this part of the installation at least once a year, preferably in the summer, so that, provided nothing untowards happens to it in the meantime, it will be ready to function without interruption during the winter when a wireless set is mostly used.

The Aerial.—The best way to overhaul the aerial is first to remove it from its attachments as by so doing the strength of the wire can be tested. Constant swaying may have weakened it to such an extent that it may snap during the usual autumn gales.

To test the strength of the wire, fasten one end round a post or a tree and pull at the other end. If the wire withstands a reasonable tension, all well and good as the wire can be reinstated.

If it breaks, a new one should be provided as it is false economy to effect a repair when the wire may cause further trouble in the near future.

It may be that the top of the aerial post has rotted if it does not possess a metal cap to keep moisture from penetrating the end grain of the wood. To remedy this defect, remove the affected part, saw the end to the shape of an inverted V and fix either a thick zinc or lead plate over the V, as shown in Fig. 1, using galvanised nails for the purpose.

Examine the pulley (if fitted) to see that it is working freely. Remove any rust with emery paper, give it a couple of coats of aluminium paint and when dry smear it over with vaseline or motor grease.

If the pole is painted, apply two coats of lead paint, and if unpainted, give it a couple of coats of creosote.

The majority of wireless poles are fixtures. Therefore, it is wise to examine the condition of the post at ground level, as in Fig. 2. If badly rotted, the safest plan is to take out the pole and remove the faulty section.

It may be that the aerial is of bare wire suspended between porcelain insulators, as indicated in Fig. 3. Clean the insulators, as a deposit of soot and dirt reduces the insulating properties of the china and consequently the efficiency of the aerial.

In reconnecting the aerial wire, make sure that all terminals are clean and bright as well as the ends of the wires.

If "lead in" tubes are used, bind a layer of electrician's adhesive tape round the outside ones to protect them from the weather.

Do not omit to examine the earth connections and wires. Crackling sounds in the receiver are sometimes caused by corroded connections.

It may be mentioned here that brass terminals can be effectively cleaned by dipping them in nitric acid and then rinsing them in water. This is much quicker than scraping. If acid is used, be careful not to allow it to touch the hands. The terminals should be fixed to a wire and then immersed in the acid.

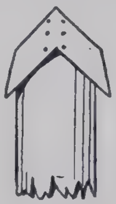


Fig. 1

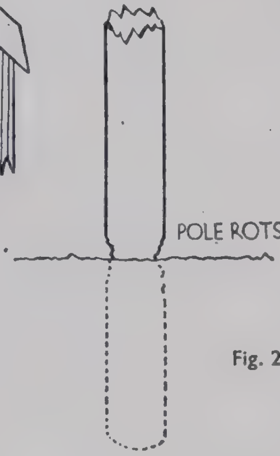


Fig. 2

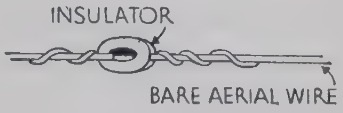


Fig. 3

The Receiver.—Assuming that the receiver is of the battery-operated type, proceed as follows: First examine all external connecting wires such as flexibles. Pull the ends of these as they may be hanging only by a few strands of wire. If the insulating covering of rubber is hard and brittle, replace with new wires.

Having dismantled all external wires, remove the back of the receiver and disconnect the accumulator and large dry battery that supplies the high-tension current to the valves. Then take out the valves, noting carefully the position of each. Put distinguishing marks on the valves 1, 2, 3, etc., so that they may be replaced in their proper sockets or holders.

Do not allow the valves to lie about with other accessories on the table, but wrap each one in paper and place them in a box.

Now remove the controlling knobs, usually to be found at the front of the instrument. In the majority of sets these parts are fixed to projecting spindles by means of grub screws, while in some a spring device is employed. Take care not to lose any screws.

If the set being overhauled is of modern design the interior components will generally be found on top as well as beneath the metal chassis, and the loud-speaker fixed either above or below the latter. In order to remove the chassis from the cabinet it may be necessary to unsolder the loud-speaker connections, but some manufacturers provide screw terminals for connecting purposes. In any case the loud-speaker leads as well as the terminals should be labelled or otherwise marked so that they can be replaced in their original position. This is important, as cross connecting may damage some of the components.

The Chassis is usually kept in position in the cabinet by means of metal screws. When these have been taken out, the chassis is free to be withdrawn.

Handle it very carefully. If necessary, support the ends on wooden blocks.

First remove any dust. This is best done by blowing it out with the aid of a vacuum cleaner. If such is not available, use a very soft-haired brush. Go over the whole of the parts systematically, taking every precaution not to apply too much pressure as this may bend a wire, causing it to touch another and thus produce a short circuit. If the tuning condensers are of the open type they should be carefully examined because any specks of dust allowed to remain are liable to get between adjacent plates and give rise to crackling noises.

Removing dust between condenser vanes is a delicate operation and is best done with a clean feather. On no account use a brush.

Having removed all dust, examine carefully all soldered connections. In doing this, try each wire by inserting the blade of a penknife under the wire and exerting a little pressure. If an unsatisfactory joint is found, resolder the part carefully.

Inspect the high tension, low tension and accumulator leads and replace them with new ones if they show signs of wear. Make sure that the ends of the flexible wires are making proper contact with the wander plugs that fit into the high-tension battery and the grid battery and scrape the spade-shaped accumulator connections if corroded.

The Loud-speaker. — It may be worth while to take out the loud-speaker and apply a jet of air in order to remove any particles of dust which may have lodged between the magnet core and the speech coil. A few particles of dust here will cause the loud-speaker to give unsatisfactory reproduction. If the speaker is working well, however, it is advisable not to interfere with it in any way.

The Valves.—Having replaced the chassis into the cabinet, refitted the control knobs and reconnected the loud-speaker, the next step is to get the valves tested, especially if they have been used for over 1,000 hours. It does not necessarily follow that because the heating filaments are intact that the valve is in first-rate condition. In time they gradually lose their electron emission qualities, a symptom of which is lack of volume of sound from the speaker.

Take the radio set with the old valves to your local radio service engineer and he will be able to tell you whether they are functioning normally or not, by either substituting new valves or testing them with an instrument.

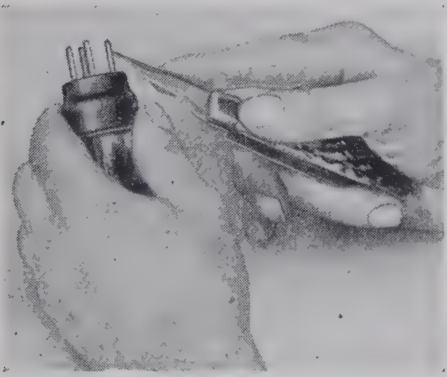


Fig. 4

If you do not possess a voltmeter it would be as well to get the high tension and grid batteries tested at the same time.

In replacing the valves it is as well to see that the pin contacts are making proper contact with the valve holder sockets. If they appear to be loose, open the pins a trifle by carefully inserting the point of a pen-knife in the slots provided for the purpose. This operation is seen in Fig. 4.

An ill-fitting pin can be made to fit tightly in the socket by carefully wrapping a small piece of tin or lead foil round it, as indicated in Fig. 5.

The Accumulator.—It is advisable to wash out any deposit which may have formed at the bottom of the cell, with distilled water or have this done next time the accumulator goes to the radio stores for recharging, unless, of course, you recharge your own.

Mains Sets.—The above also applies in the main to radio receivers obtaining their power from the electricity supply, except those remarks referring to the batteries and accumulators.

It is hardly necessary to point out that on no account should any work be carried out on such a set whilst it is connected to the mains.

Particular attention should be given to maintain the mains connecting lead in good condition, and light capacity fuses only should be used for protecting the set.

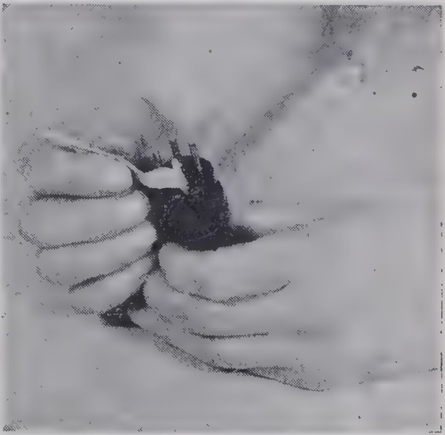


Fig. 5

If the receiver obtains current from a power plug the light fuses previously mentioned should be inserted in the circuit between the plug and the set.

FIXING AND CONNECTING ELECTRIC LIGHT FITTINGS

The usual method of fitting practically all modern hanging fittings is by means of a plate (on which there are three or more hooks) secured to the ceiling and chains from the plate to the bowl or chandelier or whatever fitting it is desired to hang.

For comparatively light fittings, such as a small bowl, it is generally satisfactory to secure the plate to a wooden block, which is first screwed to the ceiling through the laths, as represented in Fig. 1.

But for anything more than the very lightest of fittings this is not really a safe method.

It is preferable therefore, either to secure the block to a joist, if there is one in the right place in the ceiling, or else to construct a cross member in between two beams as in Fig. 2.

Two small pieces of wood A and B (about 1½×½ to ¾ in. thick) are first nailed to the joists as shown, and then a piece C about 6 in. wide is placed across A and B and secured with screws.

If a ½ in. thick round block is used, two 3 in. No. 8 countersunk screws will be found most suitable for securing it to a cross member of this description.

For screwing straight in to a joist a shorter screw than this will be required, and for screwing into laths it will be found best to use a fairly thin screw, usually a 2 to 2½ in. No. 6.

Fixing the Block.—Assuming that the point has already been wired ready for the fitting, the first thing to do is to fix the block. This must previously have been drilled to take the wires and the screws.

A fairly large hole—about ½ in. in diameter—should be drilled for the wires in the centre of the block, and two smaller holes—about ⅛ in.—for the screws. These small holes should be countersunk, and care must be taken that they will not be in the way of the screws that will secure the hook-plate to the block.

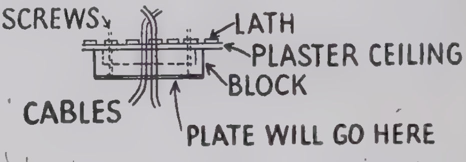


Fig. 1

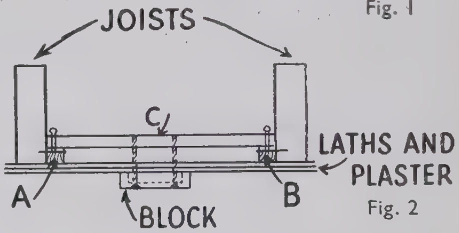


Fig. 2

The wires should then be brought through their appropriate holes and the block screwed into position.

The next step will depend largely on the fitting itself, but for the sake of simplicity we will go through the process of fitting and adjusting an ordinary bowl-type fixture.

In this case the first thing to do, before screwing up the block, is to join a piece of good quality flex of double vulcanised class of suitable length on to the wires coming through the block. The method of doing this, again will partly depend on the type of plate to be used, owing to the fact that the space behind different plates varies a good deal. If there is room behind the plate the best method is to use a china connector as illustrated in Fig. 3.

Stripping the Wires.—First strip the wires to a distance of just under

½ in. from the ends and then double back the bared part.

The cable used for house wiring is insulated with vulcanised rubber and this is protected by a layer of tape (in the case of lead cable) or by a layer of tape and a further layer of a thicker braided material (in the case of V.I.R. or vulcanised india-rubber), treated with a waxy compound.

These outer layers are not insulating and if they are allowed to come into contact with the bare wire, when any damp gets to them, they actually become poor conductors and thus cause a slight leakage of current.

In order to avoid this, it is customary to strip these coverings back a little further than the rubber, thus preventing their coming into contact with the wire.

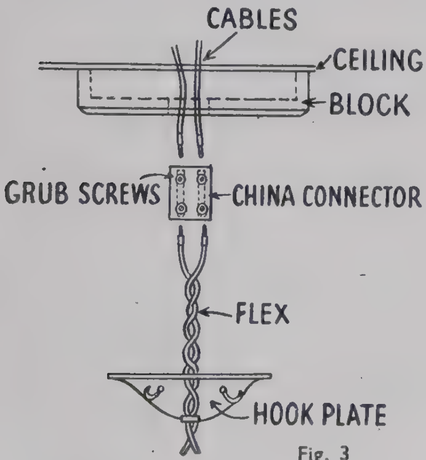


Fig. 3

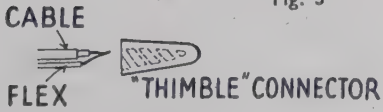


Fig. 4

Make sure that the grub screws in the connector are as tight as possible and then bind the whole joint round with insulating tape.

If there is not sufficient room behind the plate for a china connector, it may be found possible to use two "thimble" connectors. These are little thimble-shaped pieces of porcelain inside of which wide screw threads are moulded so that they screw on to the end of the cable.

The method of use is to strip the cable and flex as already explained and twist them together. Then cut the twisted wire off at the tip, leaving about ¼ in. of bare wire neatly twisted together. Now screw the connector on fairly tightly, holding the insulation of the wire in one hand to prevent its becoming twisted. When fixed, it is advisable to bind a layer of insulating tape around the base of the thimble.

Fig. 4 shows the thimble method of making the connections.

If the space behind the ceiling plate is very limited it might be found best to make the old-fashioned tape and rubber joint.

This method is to twist the flex and cable together as before, leaving about ½ in. bare wire, and then double the bare part back. Next bind the joint round with rubber tape, which should be stretched before using, and finally cover with a layer of ordinary insulating tape.

Having made the joint, knot the flex just below it to take the weight of the lamp, and then pass the flex through the plate and screw this in position.

It might be mentioned that rubber tape, which is not often seen except among electricians, is not undesirable on any joint as an added safeguard against leakage.

Hang the bowl on the chains at the approximate height required and then put the lampholder on the flex at sufficient distance from the bottom of the bowl to allow the lamp to swing clear. This clearance is important as the heat from the lamp may cause the bowl to crack if allowed to come in contact.

Final Adjustments.—In nearly all cases of reflected light—the light being, reflected from the ceiling—there is a shadow thrown round the room.

In a room with a picture rail, this can be rendered unnoticeable, and at the same time obtain the maximum amount of reflection by adjusting the length of the flex, until the edge of the shadow is level with the picture rail.

This can be done by moving the flex up and down with the hand until the required height is obtained. The flex can be cut and the holder replaced at the correct level.

There are so many different types of fitting that it would be impossible to deal with them all in detail, but it will be found that the remarks and instructions contained in this article will apply to almost any type at present available.

Chandelier Fittings.—The three or four chains used for suspending a bowl are here replaced, as a rule, by a single chain hung from a central hook in the plate.

These chandeliers are supplied with the three or more lights wired ready for connecting, but if they are not it will be generally found that either the arms which carry the lampholders are removable or else there is a removable part at the centre of the base of the fitting, which conceals a cavity which is used as a junction box.

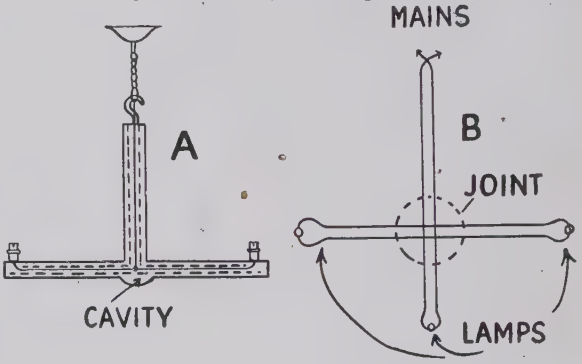


Fig. 5

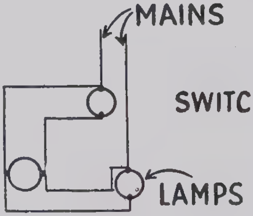


Fig. 6

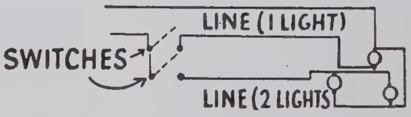


Fig. 7

The arms and the central spine of the fitting are hollow, enabling a piece of twin flex to be passed through each and a joint made in the cavity, using one of the methods already described.

This form of chandelier is illustrated at A in Fig. 5, while the wiring diagram for it is shown at B.

The fitting of a fixture of this type is slightly more complicated than that of a bowl, owing to the fact that there are two joints to be made instead of one.

The branches of the fitting are first wired, with the exception of the piece of flex through the spine.

Next, take a piece of flex long enough to reach from the ceiling plate to the bottom of the chandelier, always remembering that the strain must be taken by the chain and not by the flex. Join this to the cable protruding through the block on the ceiling and then screw the plate into position.

Next, thread the chain on to the flex, link by link, so that when the chain is extended it is intertwined with the flex.

Now support the chandelier by placing the chain on to the hook and then threading the flex through the central spine. The joint can now be made at the base of the fitting.

There are various types of chandelier, and in some of them it is necessary to join the flexes from the lampholders, somewhere other than at the base of the fitting. If this is the case, the lampholders can be looped together and a pair taken from one of them (Fig. 6).

Occasionally, it is required to have some of the lights of a chandelier separately controlled, so that it is not necessary to have them all on at once. This can only be done if there is an extra wire from the switch to the point. It is usual to loop one side of each lampholder to one side of the next, as shown diagrammatically in Fig. 7, and then take one wire from one of them, through to the return cable (usually the black) in the ceiling.

The other terminals of the lampholders of each set to be separately controlled are then looped together and one wire from each set taken to their respective switch wires in the ceiling.

Converting Gas Fittings.—There are quite a number of gas chandeliers still in existence which the majority of people discard the moment their premises are wired for electricity.

It is possible to obtain an adapter to convert the thread which normally receives the burner fittings, to a thread which will take a screw-on lampholder.

Sometimes a lampholder can be obtained that will screw straight on to the gas thread, but in any case, even if neither of these courses is adopted, it needs but the exercise of a little ingenuity to find a method for achieving the same purpose.

The lampholder can, for instance, be soldered on, or even merely suspended on the flex, coming through the tubes of the fitting, though the latter method is not a really satisfactory one, owing to the fact that the flex is inclined to fray on the end of the tube.

Whatever course is decided upon the chandelier should be wired with flex, using one of the diagrams already described for an ordinary chandelier.

As the apertures of the gas taps are usually of insufficient size to allow the flex to pass, they can be enlarged by drilling them. This is a simple matter, as such taps are generally of brass.

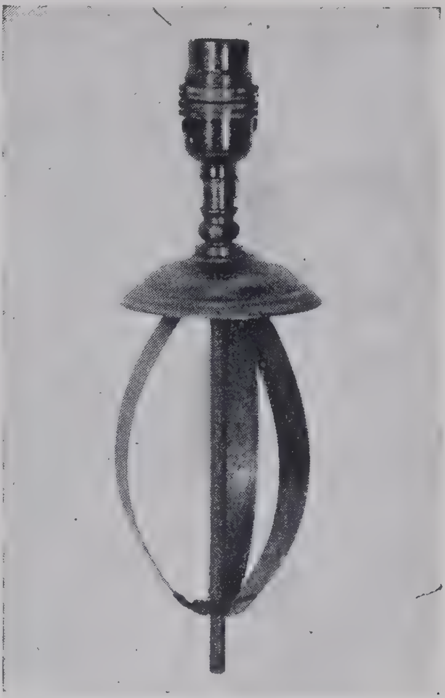


Fig. 8

If the taps are sufficiently near the ends of the tubes, the drilling can be done without removing them, though it may be necessary to remove them and then, if desired, to replace them after they have been drilled.

It is a good idea to drop some small, though fairly weighty objects attached to a piece of string or wire so that the flex can then be attached to the string and drawn through the tubes with it.

With the aid of a little thought and ingenuity, it is possible to convert many things designed for other purposes, into electric reading lamps, etc.

Adapting Oil Lamps.—Oil lamps can be adapted in a similar way.

The oil container may have a small hole drilled in the side near the bottom for the flex to come through and it may be necessary to remove some of the mechanism which alters the height of the wick, but the modification necessary should not present any great difficulties.

Suitable adapters for converting oil lamps into electric ones are to be obtained quite cheaply at most electrical stores. The advantage of using one of these adapters is that no drilling of the oil reservoir or alteration of the burner is necessary, thus enabling the lamp to be used for oil burning should the necessity arise.

Bottles and jars of an ornamental design sometimes make very attractive reading lamps and can be converted for this purpose very simply.

It is possible to buy a form of patent clip which can be expanded by means of a screw in the body of the jar to hold it firm and which is made to take a lampholder. This is shown in Fig. 8.

It is not difficult, however, to make a simple form of clip as illustrated in Fig. 9 which will generally serve the same purpose. The diameter of the circular part of this clip should be about 1⅛ in. and the length of the arms will of course depend upon the diameter of the mouth of the jar.

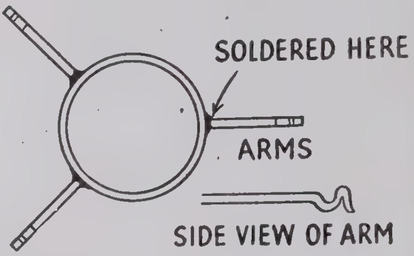


Fig. 9

The arms are soldered on to the ring and are made so that they clip very tightly on to the mouth of the jar. The lampholder can be of the ordinary switch cord-grip type and secured by means of the shade ring.

RADIOGRAM PICK-UP

ALMOST any radio set can be combined with an ordinary gramophone so that it will electrically reproduce gramophone records. The vital link between the two is a device known as a pick-up.

This holds a needle similarly to the sound box of a gramophone, but instead of directly transforming the fine wavy lines on the record into sounds, it produces varying electrical currents.

These are applied to the valves of the radio set, which then reproduces the sounds on its loudspeaker.

The quality of reproduction is quite independent of the gramophone, and good results are possible whatever the quality of that instrument.

It is advisable when buying a pick-up to obtain one that has already a volume control attached, since it is essential to have some form of volume control and to have one incorporated in the pick-up simplifies matters a great deal. It will therefore be assumed that the pick-up is fitted with a volume control.

The fitting of the pick-up is the same for a portable gramophone as it is for any other type of machine, whether table or pedestal; but in every case the length of the lead to the radio set should be as short as possible.

The first thing to do, in order to ensure the best results from the radiogram and also to lengthen the life of the records, is to obtain the correct tracking of the needle, or in other words, to find the position in which the base of the pick-up is to be screwed to the motor board.

This is when the needle is running as nearly parallel as possible with the tangent of the curves formed by the grooves in the records. It is obviously impossible to obtain this right across the record but a very near approximation can be obtained with care.

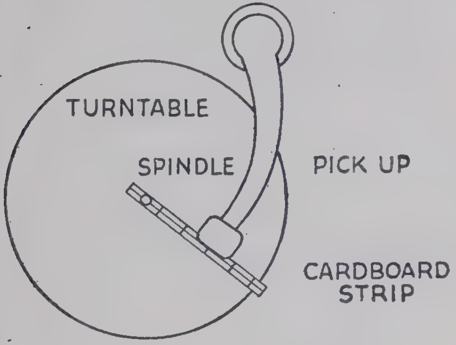


Fig. 1

Finding the Position.—The necessary appliances comprise a set square and a strip of cardboard. The cardboard should be just a little longer than the radius of a 12 in. record and 1 in. or more wide.

Near one end of this cardboard strip make a hole for the spindle of the turntable to go through. Then draw a line right down the centre of the strip and make a mark on the strip at the points at which an average record starts and another at the point at which it finishes.

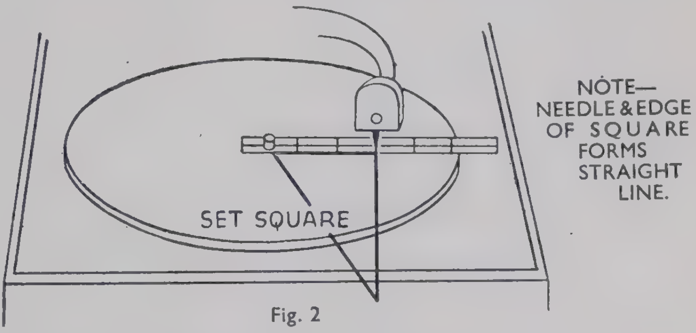


Fig. 2

Next divide the space between these marks into four equal parts. Put the strip on the turntable, at the same time inserting the spindle through the hole and then place the pick-up on the motor board with its base in a similar position to that which it will eventually occupy and with the needle resting on the centre mark of the strip and on the line down the centre. (See Fig. 1.)

Take the set square and place one of its edges along the centre line of the strip and in such a position that the right angle just touches the needle as represented in Fig. 2.

If the position of the pick-up base is correct, the line made by the other edge of the set square and the needle when looking along the edge of the square should be continuous or in other words the needle will not appear to lean over to either side as in Fig. 2.

If this is not so, the position of the pick-up must be moved about until the desired condition is obtained. Then place the needle at point 5 remembering to keep it always on the line down the centre of the strip and adjust the position again to approximately the same condition. If the needle leans over at a very great angle when viewed along the edge of the square or if the angle at which it leans over is only slight, place the needle at point 1 and then point 2 and so on. Continue these adjustments until the position of the needle on the middle mark is vertical with the least deviation at the other points.

With perseverance it is possible to get the position of the pick-up nearly correct, and there is no doubt that a little time and trouble spent on obtaining this position is amply repaid by the results.

Having obtained the position of the pick-up, trace the outline round the edge of the base with a pencil and then drill a hole inside this mark through the motor board for the connections of the pick-up to go through, and if the case of the gramophone has a back to it, a hole through this also.

The wires coming from the pick-up should be passed through these holes and the pick-up screwed in position. It may be necessary to remove the motor board from the base to do this, but this is a very simple business as the board is generally only secured by means of four or six wood screws.

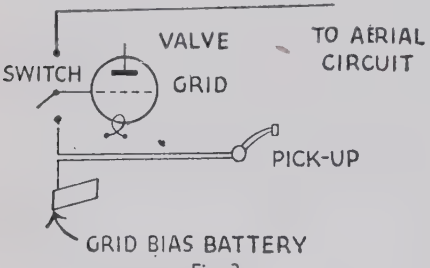


Fig. 3

Shielding the Lead.—As previously stated the length of this lead must be as short as possible, but if owing to necessity it is rather long, use a shielded wire which is wire having an outer cover of plaited wire strands.

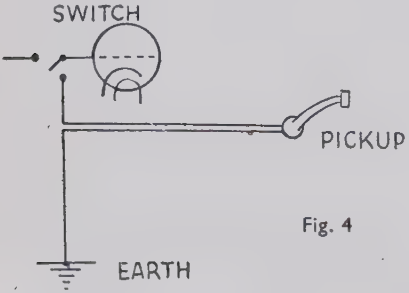


Fig. 4

Shielded wire can be bought at most radio stores and if it is decided to use it the original lead on the pick-up can be cut off within an inch or two of where it joins the pick-up and a lead of the new wire can be substituted by making a soldered joint, which should be insulated with adhesive tape.

The outer shielding should be earthed at the most convenient point by soldering a piece of wire to it and securing the wire under the earth terminal.

Connecting the Pick-up.—In the majority of modern factory-built sets, two terminals are provided at the back of the set for the pick-up leads—and as a rule a gram switch is also provided.

We will, however, describe the simplest way of connecting a pick-up to an existing set which is not provided with these terminals.

In a battery set, one wire from the pick-up lead should be taken through a switch to the grid of the detector valve, and the other to one of the negative plugs of the grid bias battery, or if preferred a separate plug can be used in the grid bias battery for this purpose alone.

It is usually found best to have this plug in a tapping of about 1½ volts (negative) but the best position can be found most satisfactorily by experiment. This circuit is shown in Fig. 3, which includes a single pole change over switch.

The switch can, however, be of the ordinary single type and merely connected so as to break the pick-up lead, but in this case it may be necessary to detune the set or even unplug the aerial when the gramophone is in use.

There are many different types of switches on the market suitable for this purpose but almost all of them are secured to the panel of the set by means of a threaded spindle inserted through a hole drilled in the panel with a nut on either side.

Whatever switch is used, however, it should be as near the valve holder as possible.

Fig. 4 shows a diagram of a circuit for connecting a pick-up to a mains-operated receiver and it will be noted that the difference here is that the lead, which in the battery circuit went to the grid bias battery, is now taken to earth. This should either be secured under the earth terminal or soldered at a convenient earth point.

The remarks regarding the switches which were made for the battery receiver apply also for the mains set.

ERECTING EFFICIENT RADIO AERIALS

In order to obtain the best results from a radio receiver, it is important to have an efficient aerial for " picking up " the wireless waves, for however good the set may be, satisfactory results cannot be expected if this part of the equipment is faulty.

An outside aerial should always be used where possible, in preference to the indoor type.

To get good results with a receiver designed to work on medium and long wavelengths, an outdoor aerial of about 40 ft. in length including the lead in will generally be found satisfactory, although in some cases it may be better to reduce or increase this length.

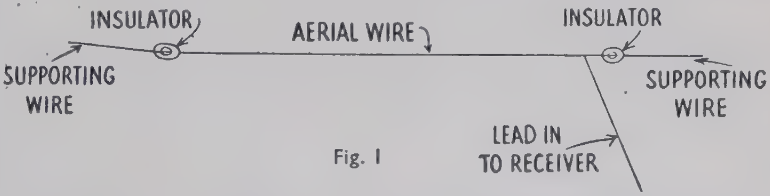


Fig. 1

If possible, the height of the pole should not be less than 25 ft. as the higher the aerial the better the results will be.

In these days an aerial of insulated stranded copper wire is favoured by a good many radio enthusiasts in preference to bare wire. One of its advantages is that the aerial can be taken direct to the aerial terminal of the receiver through a small hole bored in the window frame.

In fitting such an aerial, china insulators should be used for supporting purposes, as indicated in Fig. 1, and a pulley fixed near the top of the pole to allow the wire to be hauled up or down.

A couple of coats of white paint will make wireless aerial poles less unsightly than leaving them in their bare state.

In erecting the pole, dig a hole at least 2 ft. deep to accommodate the base, and set the latter firmly in concrete, allowing the mixture to extend about 6 in. above the ground level, as indicated in Fig. 2. This will help to prevent the pole from rotting, especially if the concrete is finished to taper upwards to allow the moisture to run off easily.

A better job can be effected by fixing the mast to a separate pedestal, the bottom part of which is concreted into the ground. The pole is supported between two side members by means of stout bolts and nuts. Fig. 3 shows the arrangement.

The advantage of such a fixing is that the pole can be taken down at any time and repainted.

A proper earth is equally as important as an efficient aerial. This should be as short as possible and connected to the earth direct by means of a proper earthing tube (A, Fig. 4) or by attaching one end of the earth lead to a cold water main. The end of the earth wire can be attached to the pipe by soldering or by using a special clip, as shown at B in Fig. 4. Hot water pipes and gas pipes should not be used for earthing purposes.

Before attaching the clip, any paint must be removed from the pipe and the surface scraped bright.

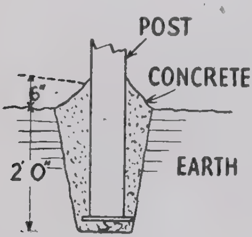


Fig. 2

An aerial fixed in the loft space between the roof and the top floor ceiling solves the difficulty of obtaining an aerial where circumstances do not permit of having an outdoor one.

To get the best results from such an aerial the insulated wire should span the loft and not be attached directly to the beams.

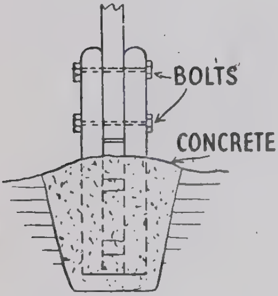


Fig. 3

In a good many cases the down lead which connects the aerial to the set can be taken outside the building by boring a small hole in the soffit which covers the space between the roof rafters and the wall.

If this method is adopted better results will be obtained if the wire is not allowed to come in contact with the wall. This also applies to the down lead of an outside aerial.

To keep the wire off the wall, fix one or more wooden distance pipes about 10 in. long and 1 in. square, and drive them into holes made between the mortar joints of the brickwork.

The wire can be held in position by means of insulated screw hooks fixed at the ends of the wood.

If it is not possible to install a loft aerial, quite good results can be obtained by fitting a "Pix" aerial, illustrated in Fig. 5.

This ingenious aerial is in the form of a narrow tape which encloses a thin metallic conductor. One face of the tape is treated with an adhesive compound, which enables it to be held in position without further support.

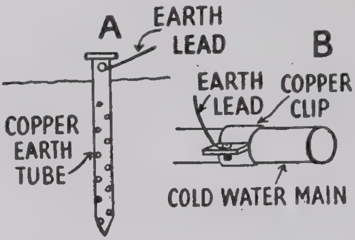


Fig. 4

A good place to fix a "Pix" aerial is just below a picture rail, where it will hardly be seen. A length of flexible wire is attached to the aerial ready for connecting to the radio receiver.

A picture rail can also be used for accommodating a suitable length of flexible insulated wire aerial which can be stapled down at intervals to the wood to keep it in position. In using flexible wire the starting end—that is, the end furthest from the receiver—should be covered with a small piece of electrician's adhesive tape to prevent any stray strands of the wire touching surrounding wood or the wall.

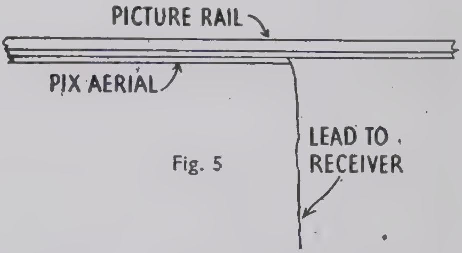


Fig. 5

It is advisable to fit a lightning arrester in the circuit of an outside aerial. There are several devices for this purpose to be had and their use is much to be preferred to the old-fashioned method of employing a switch, Fig. 6 shows a sketch of a reliable lightning arrester which is automatic in action.

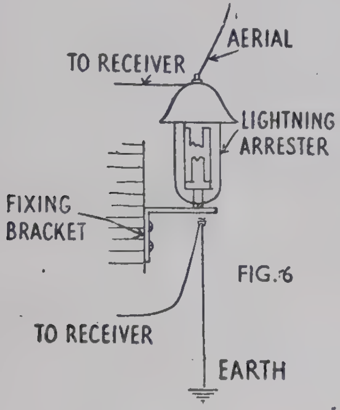


Fig. 6

A great number of modern receivers are provided with means of receiving short-wave transmissions—i.e., between 10 and 100 meters. A suitable aerial for such a set is known as a doublet or di-pole aerial and consists of two separate lengths of wire each about 15 to 20 ft. in length. These lengths are arranged in one straight line and insulated at the middle as shown diagrammatically in Fig. 7. The lead-in consists of heavy twin twisted cable, the top ends of which are connected one to each section of the aerial in the position shown. The lower ends are connected to the primary terminals by a special type of H.F. transformer, the secondary terminals being connected to the receiver terminals.

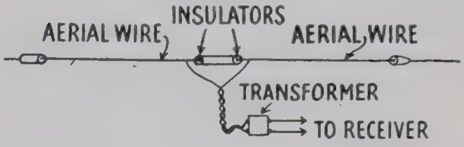


Fig. 7

In erecting an aerial of this type it is essential to keep the wires parallel to the ground and also to keep the wires of equal length.

As such an aerial is more or less directional, it is advisable to erect it in such a position that the transmitting station is approximately at right-angles.

ALTERING BATTERY-OPERATED BELLS TO MAINS

The trials and troubles of battery-operated domestic electric bells can be eliminated by using the electric light supply, provided the current is alternating.

No extensive alterations in the existing bell wiring are necessary. A few feet of twin-insulated bell wire and staples for fixing, a short length of twin lead-covered electric light cable, a lighting switch, a bell transformer, a few screws and a piece of insulation tape complete the list of materials. The tools required are a light hammer, screwdriver, soldering iron, solder and flux, and perhaps a tool for plugging the wall.

The Transformer.—A good type of bell transformer is shown in Fig. 1, and can be purchased at the majority of electrical stores. It measures 4 × 3 in., and the parts are housed in a bakelite case.

The transformer reduces the high voltage of the supply to one suitable for operating the bell and indicator, which may require three, five or eight volts.

The transformer is a simple piece of apparatus and consists of a number of thin iron stampings upon which are mounted two separate coils of insulated wire, known respectively as the primary and secondary coils. The primary coil comprises a large number of turns of thin insulated wire and is connected to the supply, while the secondary has a few turns of comparatively thick wire, and is connected to the bell system. The pulsations of the alternating current flowing in the primary coil set up magnetic impulses in the core, as the metal stampings are called, and induces a corresponding current in the secondary. The ratio of the voltage in the secondary and primary will be approximately that of the numbers of turns in their respective windings.

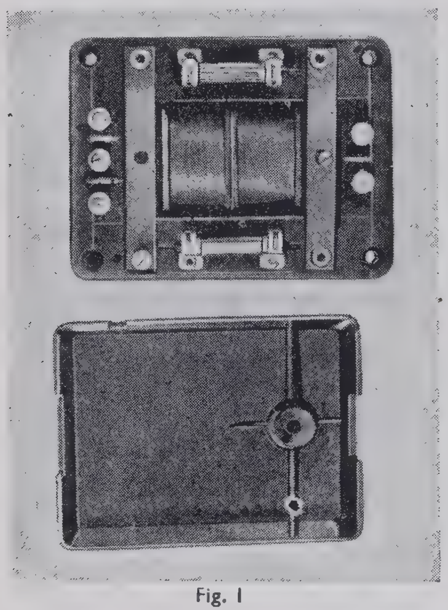


Fig. 1

In order to keep the length of connecting cable as short as possible, the transformer should be fixed near to the source of supply. The best place will be at the side of the distributing fuse board to which it can be connected. A switch should also be inserted in this circuit so that the transformer can be cut out in the event of a fault developing in the bell installation.

A good place to mount the switch is at the side of the transformer, and to do this the transformer and switch should be mounted on a small wooden board having fillets at the back to provide a space between the board and the wall. As the connecting wires will pass through the wooden base the latter must be drilled with suitable holes. Such a board with the transformer and switch mounted upon it is illustrated in Fig. 2. Should the wall be of brick, it will be necessary to plug it to obtain a good fixing.

Fixing Wires.—Having disconnected and removed the batteries, the battery wires should be extended from this point to the transformer. In fixing the twin bell wire, leave about a foot at each end for connecting purposes, and when using staples for keeping the wire in position see that they are not driven in too far, otherwise one may cut through the insulation and set up a short circuit. The use of insulated staples with a piece of fibre over th metal loop will obviate this risk.

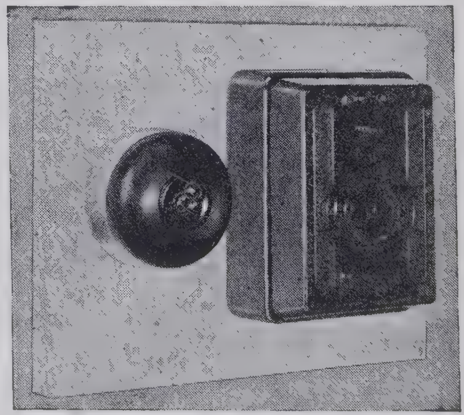


Fig. 2

One pair of bared ends of the extended bell wires are connected to the battery wires by twisting each pair together and applying a little solder to each joint to ensure perfect contact and then binding each joint separately with a short length of insulation tape, slack wire being twisted round a pencil or similar article to form neat coils. The other ends of the wire are connected to the secondary terminals of the transformer. Three such terminals are generally provided to give voltages of three, five and eight volts respectively. It is advisable first to connect the wires to the terminals giving three volts, and if this is not sufficient, a higher voltage can be tried.

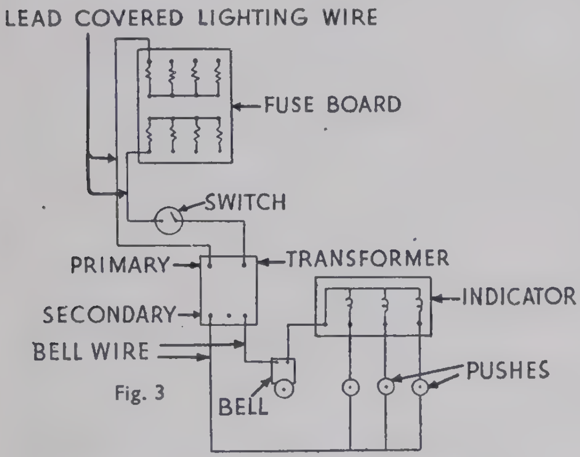


Fig. 3

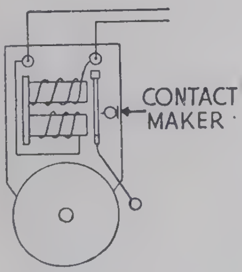


Fig. 4

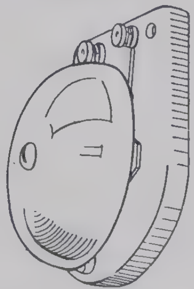


Fig. 5

Lead-covered Cable. — The next operation is to fix the lead-covered lighting cable and to connect it to the fuse-board. Before doing any work on the fuse-board, turn off the current by opening the main switch. On no account must the board be touched when alive.

Having fixed the lead-covered wire and allowed about a foot or so at each end for connecting, remove the lead sheathing for this distance by lightly nicking it at the top and underside and then bending it. This will sever the lead. The unwanted piece can be removed by holding the main sheathing with one hand and drawing the short piece off with the other. Remove about ½ in. of the insulation from the wires and connect one wire to the top terminal of the upper fuse-clip and the other to the bottom terminal of the lower fuse-clip of a pair of fuses. The other end of the lead-covered wire is treated in the same manner and connected to the top or primary terminals of the transformer. This completes alterations to the wiring, a diagram of which appears in Fig. 3.

There remains the task of altering the bell. This involves nothing more than cutting the contact maker out of the circuit, leaving the magnet coils connected as in Fig. 4.

If the bell is corroded, it should be substituted by a new one of a type specially made for use with a transformer. Such a bell is shown in Fig. 5.

When the work is complete the current can be turned on at the main switch and the bells tested. If too weak, make the adjustment on the secondary terminals of the transformer.

ELECTRIC FIRESCREEN RADIATOR

An inexpensively constructed electric radiator is described below. Its current consumption is only 500 w. and it can be made easily with ordinary tools. Fig. 1 shows the suggested design for the radiator.

The materials required are an ordinary 500 w. bowl such as can sometimes be bought second-hand, a sheet of copper, some copper strips and rivets. The copper sheet should be about 1 ft. 9 in. × 1 ft. 6 in. and about $\frac{1}{16}$ in. thick.

Construction.—The first thing to do is to cut a hole in the centre of this sheet, just large enough for the bowl to pass through, with the exception of the lip on the reflector of the fire. The fire is later to be clamped at the back of the screen, so that this lip is pressed hard against the front of the copper sheet.

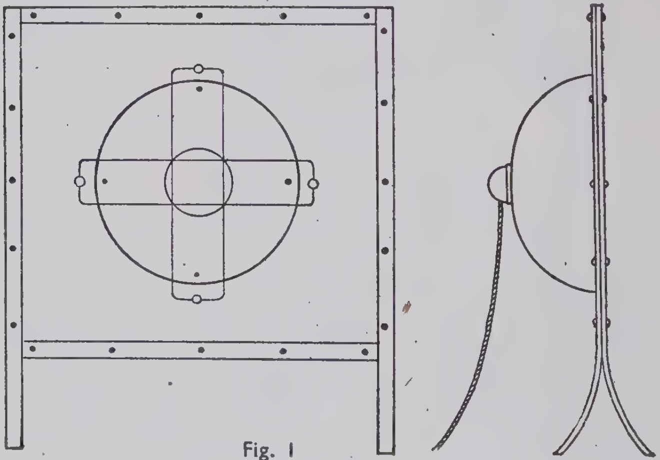


Fig. 1

The relative size of the hole and the fire is illustrated in Fig. 2, which shows the screen cut in half and viewed from one side. The usual size bowl fire is of 11 in. diameter and in this case the size of the hole will be about $10\frac{7}{8}$ in. diameter.

The best way of cutting a hole as large as this, is to mark out the hole and then drill a series of small holes (say $\frac{1}{8}$ in.) all round just inside the mark.

These small holes should just touch or overlap each other and when the circle is completed, the inside will fall out. The hole can then be filed out with a round or half-round medium file, exactly to the line.

Marking Out.—Some slight difficulty may be experienced in marking out the hole. If a compass large enough for the purpose is not available, a substitute will be found by using a nail and a piece of string. Tie the string to the nail and knock the nail through the very centre of the copper sheet. Then fasten the pencil on to the other end of the string, so that the mark made by the pencil, when the string is stretched, is exactly the same distance from the nail as the length of the radius of the circle is required.

Drill four holes at equal distances from each other round the circle. They should be about $\frac{1}{2}$ in. from the edge of the aperture and $\frac{1}{8}$ in. in diameter.

Next, along the top (which is one of the longer sides) drill five holes; one at each end, at a distance of $1\frac{3}{8}$ in. from the side and then three more between them spaced at equal distances apart.

Treat the bottom in the same manner.

The sides must also have five holes drilled in them, but this time the distance from the end holes from the top and bottom is to be 1 in. and the distance between the remaining holes 4 in. All these holes should be at a distance of ⅜ in. from the edge of the sheet and ½ in. in diameter. The position of the holes is shown in Fig. 3.

Hammering.—A radiator of this sort looks much better if the screen is "hammered." This effect is obtained by banging the copper all over at an even strength with a rounded hammer.

A special hammer is obtainable for the purpose, but if you have one with one side flat and the other side rounded to the shape of a ball, it will serve the purpose equally well.

The copper should be placed on a wooden bench, and no attempt should be made to keep all the hammer marks in straight lines. Hammer the sheet all over, at the same time making the indentations even and equidistant. It is as well to experiment on an odd piece of metal before starting on the actual screen.

The Strips.—The next job is to cut and drill the copper strips, which are to go round the sides of the screen. These strips should be ¾ in. wide × $\frac{3}{16}$ in. thick.

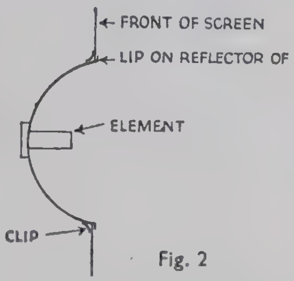


Fig. 2

Four strips, each 24 in. long, will be required for the front, back side pieces and four similar pieces 1 ft. 9 in. long for the top and bottom. These should be drilled with holes to correspond with those along the edges of the screen and in the exact centres of the width of the strips.

The additional length of the strips for the sides allows them to project sufficiently at the bottom so that they can be curved away from the other in the shape of a curved inverted V as shown in Fig. 1.

These side strips can be curved before riveting them in position down the sides of the screen. Then rivet the strips along the top and bottom.

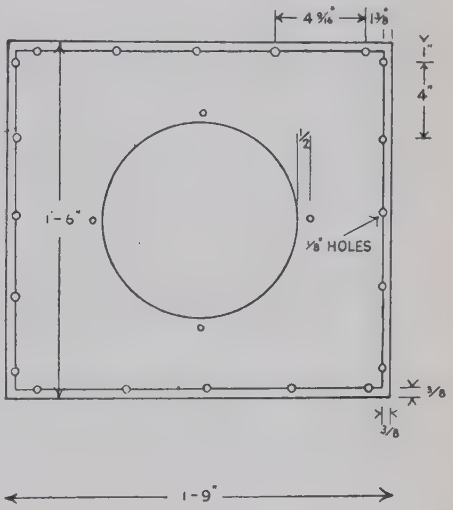


Fig. 3

Use round headed copper rivets (⅛ in. thick) and get them slightly longer than the thickness of the complete screen—about ½ in. File these down so that when they are pushed through the holes in the two strips and the sheet they will project about $\frac{1}{16}$ in.

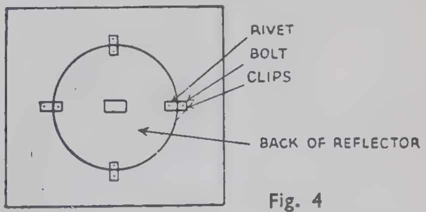


Fig. 4

Now place a rivet through the strips and sheet, rest the head on some hard metal object like the top of the vice and hammer the end of the rivet until the burr that results holds all three pieces of metal closely together. The head of the rivet should, of course, be in front of the screen.

When all the strips have been riveted on, the next item to claim attention is the fixing of the bowl fire.

The method of doing this is shown in Fig. 4, and the clip is also to be seen in Fig. 2.

The clip is made of the same material as that used for the edges of the screen and the angle at which it must be bent is best found by experiment.

Four holes must now be drilled in the reflector of the bowl fire. These should come opposite the holes around the edge of the aperture in the screen.

Next, holes should be drilled in the clips to correspond one with a hole in the bowl and one with the hole in the screen.

The heavy metal stand which is usually fitted to bowl fires will not be required so this can either be removed at the hinge or sawn off with a hacksaw.

The clips should now be riveted to the back of the bowl secured to the screen by means of bolts passed through the clips and nuts at the back.

The Guard.—It is really not safe to use an electric radiator without some sort of guard.

This guard usually takes the form of thick wire secured across the front of the fire.

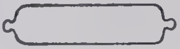


Fig. 5

The best way to construct a guard is to get two lengths of No. 12 S.W.G. and bend them to the shape shown in Fig. 5.

The complete loop at one end can be formed round a screwdriver or some similar object and the loop at the other end can be made without much difficulty by means of a pair of pliers or in a vice. The distance between the parallel wires of the guard, should be about 3 in. and four loops at the ends of the guards can be secured under the heads of the bolts, which hold the bowl fire.

It will be necessary to put a fairly large washer under each bolt and these can be made if desired out of the same material as the screen.

When this has been fitted, the whole screen except the bowl should be cleaned and polished with a good metal polisher and given a coat of clear cellulose lacquer which prevents the metal from becoming tarnished.

ELECTRIC INSET FIRE

The greatest advantage of the inset electric fire over the ordinary portable type is the comparatively small amount of space which it occupies.

A three-bar (3 kilowatts) portable fire is rather cumbersome and not really a very sightly article of furniture. In a very small room, even a single bar fire is apt to occupy quite a lot of space.

The inset stove is gradually becoming an almost universal standard fitting in the modern house and one of the many types available is shown in the accompanying illustration, Fig. 1.

The power point or source of supply will be discussed later, but at the moment it will be assumed that there is a point already in the vicinity of the position at which the stove is to be fitted.

It should be noted, however, that electric heating devices must not in any circumstances be connected to lighting points. Therefore, a plug that figures in a lighting circuit will be quite unsuitable.

There are definite regulations which prohibit their use for loads such as would be imposed by fires or radiators.

Also, in most cases, it is necessary to obtain the permission of the local supply authority for the installing of any apparatus which is to be permanently fixed. Subsequently, it may be subject to inspection and approval before it can be finally connected in circuit.

It will be appreciated that this control and supervision of what is really quite a simple job, are enforced in the interests of the consumer, and must not be regarded as unnecessary red tape. As has often been proved, electricity while being a useful and versatile servant, is a very dangerous master. Safety precautions must be observed and enforced or serious trouble may result.

The constructional work involved in fitting a panel fire is straightforward.

The stove usually projects at the back to a depth of about 4-6 in. and a space in the wall just over that depth is therefore necessary. The width and height of this aperture should, of course, be less than the face of the stove, so that the face of the stove completely covers it when in position.

Fitting.—The method of fitting the stove is usually to make the mouth of the aperture just large enough to take the body of the stove, upon the bottom of which are fitted two spring clips.

At the top of the stove through the front face part is a hole to take a screw. The stove is forced into the aperture and screwed into position through the hole, the clips holding the bottom firm as in Fig. 2.

It is obvious that the mouth of the aperture must be hard and solid. Furthermore, since we have to bring wires in through the bottom of the aperture and since the clips have to slip over something, the aperture must be of greater dimensions inside than at the mouth.

If the stove is to fit flush on to a wall without a surround of any description, the best method is to fit into the mouth of the aperture an iron frame, which can usually be supplied by the makers of the stove.

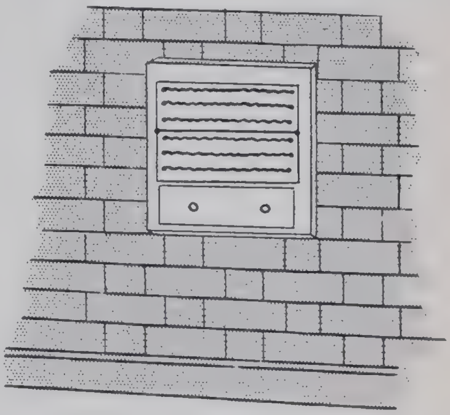


Fig. 1

The frame is generally cemented into position, and has at the top a threaded hole to take a metal screw which passes through a corresponding hole in the face of the stove.

The Surround.—This method can also be used for fitting a stove in a tiled surround and is very convenient where there was originally a coal grate. The front of the grate is bricked up and tiled to match the original surround. The frame is cemented into position as before.

Sometimes the frame has two threaded fixing holes, one at the top and one at the bottom, the bottom one replacing the metal clips.

This method of using an iron frame

is probably the best available, giving a very firm and easily obtained fixture. It is illustrated in Fig. 2.

A very common method which has come into use recently and which gives a very pleasing effect is to use a surround made of a composition very closely resembling slate. This material can be obtained in various colours and in such effects as marble, etc., and can be drilled fairly easily.

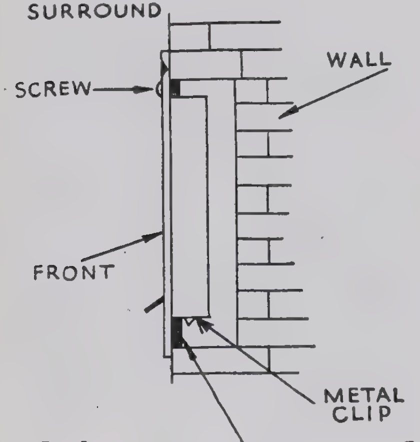


Fig. 2

The usual type of fixture with a surround of this description is very similar to that using the iron frame There are the same clips at the bottom of the stove but instead of a threaded hole in the frame, there is just a plain hole drilled in the surround.

If possible it is preferable when cutting out the aperture in the wall or having a space bricked up, to allow the brickwork behind the hole in the surround to remain solid so that it can be plugged to take a wood-screw through the front of the stove.

If this is not done, however, it is generally found not too difficult to plug the actual hole in the surround itself, though the chief disadvantage of this is the fact that each time the stove is removed for examination it necessitates the re-plugging of the hole.

Another method of fitting this type of surround is to plug the brickwork through the surround, using either two or four holes in the face of the stove. The surround itself is usually fixed by means of a wood-screw and plug in each corner.

Screws.—An ordinary wood or metal screw with the slotted head is not very decorative and therefore the screws that are generally used are slightly different.

A hole is drilled in the very centre of the head (the screw being of the flat countersunk type) and this hole is threaded. The usual slot passes right across the hole so that the screw can be inserted by means of a screwdriver in the usual way.

With the screw there is supplied a semi-circular chromium plated knob with a thread projecting from the centre of the flat side. This knob screws into the hole in the screw itself, and when the whole thing is in position, nothing is visible but a neat little plated knob.

The connections to the stove are usually made to terminals underneath a sheet iron cover that encloses the whole of the back of the stove.

These terminals are generally situated at the bottom of the stove, and if it is of the "multi-bar" type a spare terminal will generally be found on the switch controlling one of the bars or 1 kilowatt elements, and another terminal will be found which connects direct to one of the bars.

The Connections to a typical three-bar, two-switch type of stove are shown in Fig. 3. It will be noticed that the positive from the supply goes to the switch and the negative to the element.

An important point which must never be overlooked is the earthing of the stove.

Somewhere near the other two connections will be found a terminal which makes contact with nothing but the case or frame of the stove. This is the earth terminal.

The earth wire which connects here should be of stout copper wire and should be connected at its other end to the conduit or lead casing of the cable supplying the stove. This conduit should be earthed in turn, according to the supply company's requirements.

The cable to the elements should somehow be brought into the cavity behind the fire either through the side or at the bottom.

It will be noticed in Fig. 2 that a space has been left for this purpose at the bottom, the cavity continuing a little below the bottom of the stove.

When a surround has been specially built to house an electric stove, the wiring is, of course, quite simple as it can be done before the surround is completed. When the surround has been adapted for this purpose, there will not be any wiring "built in."

It is necessary, therefore, if the wiring is to be concealed, to knock a hole through the side of the cavity as near the bottom as possible to come out somewhere on the side of the chimney breast.

In the case of a tiled surround this is not very difficult as there is generally a fairly thick layer of plaster in between the bricks of the wall and tiles.

It is nearly always the practice to install beside the grate (except when the wiring is built in) a 15 amp. switch plug. The wires from the stove are then plugged into this fitting. This method has the advantage even in the case of built-in wiring of providing a readily accessible switch, by means of which all current can be cut off from the stove in time of necessity. This plug should be of the three-pin type, the earth wire being connected to the third pin.

The wiring of a one-bar fire should be carried out with cable not smaller than 7/.029 (seven-strand wire, each strand of which is .029 in. in diameter).

In the case of two or three elements, the wiring should be at least 7/.036.

The wiring can be carried out in various systems. There is the ordinary vulcanised india-rubber (V.I.R.) in which the cable is taken through steel tubing or conduit. A system which is quite extensively used in the lead wiring system. In this case the insulated wire is enclosed in a casing of lead. In both these systems the metal casing must be efficiently bonded and earthed.

Another system which has become very common recently is the "tough rubber" system. The wire in this case is covered by an extra layer of specially toughened rubber.

In the two latter systems it is advisable to pass the cable through tubing where it goes through the wall or behind the tiles particularly in the case of tough rubber.

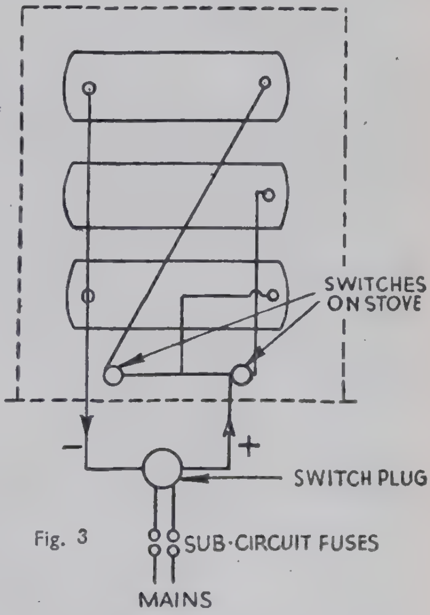


Fig. 3

In every case the point must be on a separate circuit and protected by a pair of 15 amp. capacity cut-outs.

INSPECTING THE NEW HOUSE

THINGS TO DO ABOUT THE HOUSE

SAFETY FIRST IN THE HOME AND WORKSHOP

Most mishaps, the results of which may be of a very serious nature, can be avoided if care is exercised. The examples given are some of the simple steps which differentiate between danger and safety.

The Position of the Kettle.—The illustration appearing at Fig. 1 shows a thoughtless method of placing a kettle on a lighted gas stove. It will be observed that the spout overhangs the front where anyone passing may get badly scalded from steam or, worse still, catch the projecting spout with the clothing, with disastrous results.

The Household Steps. — Fig. 3 shows a method of seeking trouble with a pair of household steps. The assistant is standing on the weakest part and may bring disaster to both himself and his companion.

Never allow anyone to stand on the cross-rail of a pair of steps.

Loose treads, faulty hinges, a loose cross-piece and frayed cords should be remedied at once and, when replacing worn cords, see that they are well stretched and that the knots are so adjusted that the angle formed between the steps and the back is neither too acute nor too obtuse. The treads should be quite horizontal when the steps are in the open position.

Window Sash Lines.—Many accidents are caused by broken window sash lines. The cords should be examined periodically and worn ones replaced.

Remember that there are several qualities of sash cord. Only the best should be used. A little tallow applied to the cords will prolong their life.

Picture Cords. — Heavy picture frames should never be hung at the head of a bed.

Slipping Mats.—Mats slipping on polished lino are another source of danger and many an arm has been broken from this cause. The remedy is not to polish the lino under the mats.

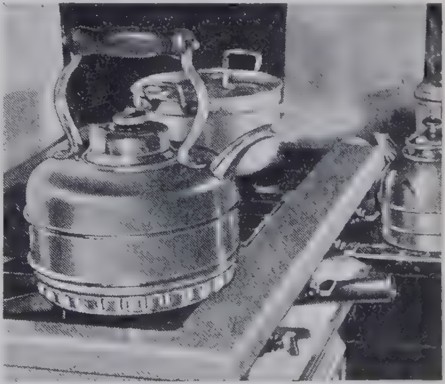


Fig. 1

A Cracked Hand-basin.—A cracked hand-basin is extremely dangerous and might have serious consequences should an unwary user apply pressure to the faulty part. Fit a new basin sooner than run this risk.

A Loft Ladder.—If you possess a loft ladder of the flimsy type, always get someone to place their feet at the base to prevent it slipping when using the ladder. Never attempt to rear a ladder by yourself but get a helper to stand at the bottom rung when so doing.

Removing Broken Glass. — In removing broken glass from a window sash or other fitment use an old pair of gloves or a duster to protect the hands, and do the job gently to avoid cuts.

Electric Fittings.—Before fixing an electric light bulb into a fitting see that the current is switched off. The filament of the lamp may be faulty and cause the lamp to explode.

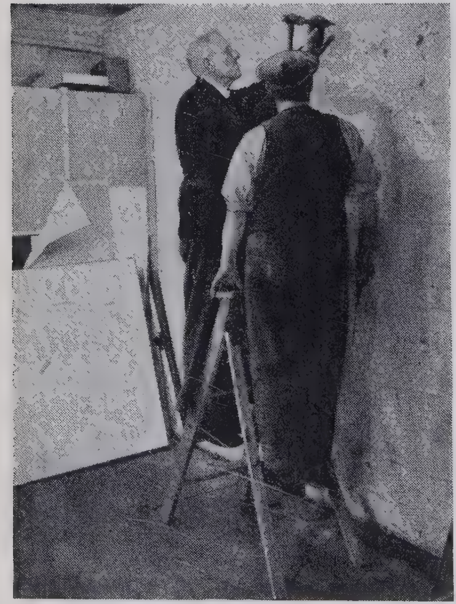


Fig. 3

Never touch any electrical equipment whilst having a bath. Even if the switch operating the light is shock proof, there may be a surface leak which, if touched, may give a bad shock. In the event of a switch being within reach of the bath, have it removed to a safer position even if the switch has to be fixed behind the door.

Fig. 2 shows a safe type of electric radiator for use in a bathroom. It consists of a heating element and a chromium-plated reflector which can be adjusted up or down as desired to focus the heat rays. The heater should be fixed at a height of about 7 ft. on a wall well away from the bath and wash basin, and it should be connected to a 3-pin combination switch-plug at the side to enable it to be efficiently earthed.

An excellent and safe electrical device in the shape of a plug and socket known as an "M.K." has an insulated shutter which covers the sockets when the plug is withdrawn. Such fitments are invaluable in a home where young children may push scissor-points and other metallic objects into unprotected sockets with unpleasant and sometimes dangerous results.

Before effecting any repair or adjustment to the domestic electrical installation, the current should be switched off at the main switch, as this removes any likelihood of shocks and burns, and before making adjustments to a mains radio receiver always disconnect it from the supply.

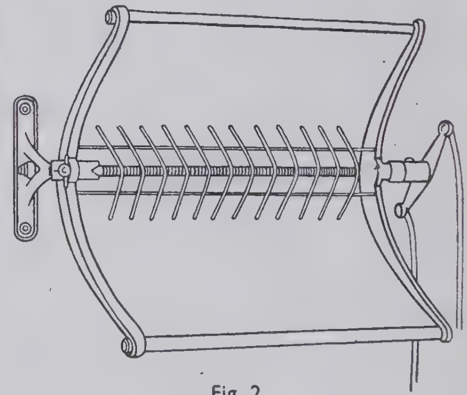


Fig. 2

The Fire Guard.—Some people responsible for the welfare of children may not know that it is a serious offence not to provide an efficient guard in front of a household fire for the protection of children; so the provision of this safety device should never be overlooked.

Safety Gate.—It is also a wise plan, when an upstairs room is used as a nursery, to fit a gate at the top of the stairs to prevent youngsters from falling down. An article describing the construction of an efficient fireguard will be found elsewhere in this volume.

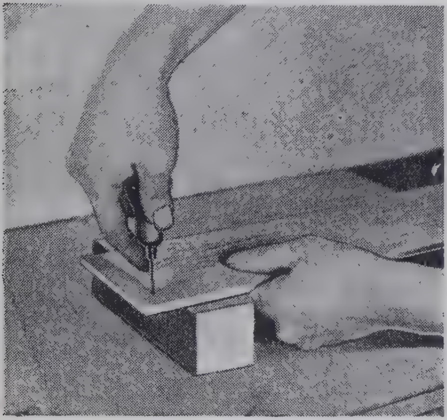


Fig. 4

Sources of Danger.—Loose slates and tiles, faulty gutters and defective ceilings are a source of danger.

Keep a look out for, and remove, rotten branches of trees and do not let rambler roses project over a public footway. You are responsible for any injury they may cause.

A nail projecting upwards from a piece of wood lying on the floor of the workshop is a menace to the unfortunate individual who happens to tread on it. Always withdraw nails from unwanted wood before casting it on the floor.

Fig. 4 illustrates the wrong way to hold a bradawl when boring a hole in a thin piece of unsupported wood, for unless pressure is relieved when the blade is nearly through there is every likelihood of the point penetrating quicker than expected, with the result that the forefinger gets a nasty pinch.

When unscrewing the back iron from the cutter of a plane, support it on the

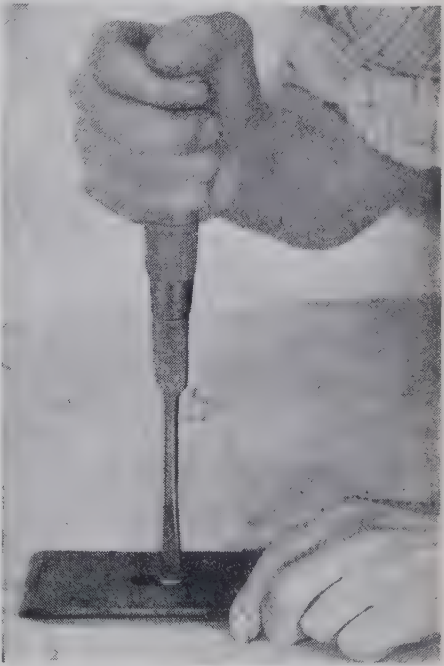


Fig. 5

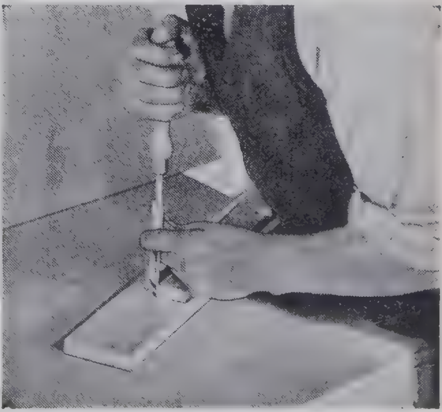


Fig. 6

bench as shown in Fig. 5. Unscrewing it in the hand is seeking trouble because the cutter may slip and cause a nasty gash.

How to Hold a Chisel.—Carpenters' chisels are useful tools if properly used, but dangerous if incorrectly applied. Fig. 6 shows the safe method of holding a chisel when paring the corner off a piece of wood.

Avoid Loose Hammer-heads. — Loose hammer-heads should not be tolerated. Apart from the inconvenience of using a tool in this condition, there is the danger of the head flying off the shaft.

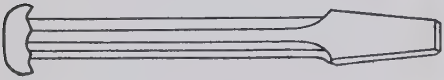


Fig. 7

A greasy striking-face of a hammer may cause it to slip off the head of a nail, resulting in bruised fingers. To avoid this, rub the face of the hammer on the ground.

Damaged fingers may also result from using a cold chisel whose head has become flattened and badly burred as Fig. 7 shows. Before a chisel reaches this state, grind off the jagged edge.

Using a file without a handle is a practice to avoid, as is the foolhardy trick of shifting a belt on a machine in motion.

Engine Repairs.—The loss of two fingers, a badly mutilated hand and a couple of months in hospital was the reward of a motor-cyclist who unthinkingly attempted to make an adjustment whilst the engine was running. The driving chain and sprocket wheel was responsible for these injuries.

Cranking a motor-car engine, unless done properly, may cause a broken wrist, should the engine backfire. Grip the handle as shown in Fig. 8; never as indicated in Fig. 9.

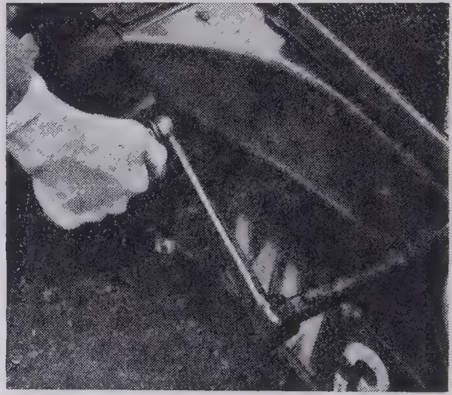


Fig. 8

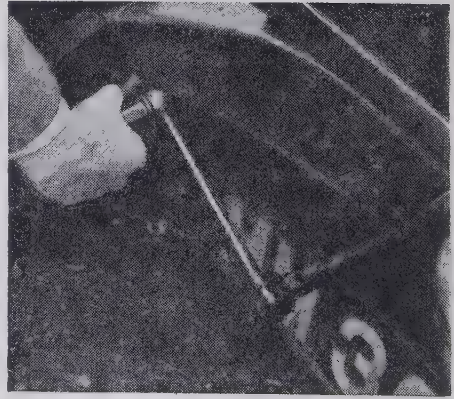


Fig. 9

Running a motor-car engine in a closed garage should be avoided. If it is necessary to let the engine run in the garage, open the doors and windows so that there is ample ventilation, otherwise deadly carbon monoxide from the exhaust may fatally overpower you.

MAKING AN OLD CYCLE LOOK LIKE NEW

A CYCLE of good make will give years of service provided it is looked after and adjusted in a proper manner. There comes a time, however, when it pays to dismantle the machine and give it a thorough overhaul, when every part can be examined and adjusted and faulty ones replaced.

If the machine is shabby, no better time can be chosen for re-enamelling it than when the parts are dissembled, and if the following instructions are carried out the machine will be given an extra lease of life and will also look like new.

Let us assume that an ordinary cycle of general purpose type is to be overhauled and enamelled.

Before beginning the operations, obtain a few empty tins in which to place small parts such as bolts and nuts, as small items are easily lost if left about. It is also worth while to make a support for handling the machine when re-enamelling.

A Convenient Support.—Such a device for screwing down to the bench or other suitable fixture may easily be constructed quite cheaply and is shown in Fig. 1. It consists of nothing more than an iron backplate having a ¾ in. screwed hole in the centre, a short length of ¾ in. gas pipe screwed at both ends, a ¾-in. screwed tee-piece and a couple of lock-nuts, all of which can usually be obtained at the local ironmongers. A lock-nut is first screwed on the ends of the pipe and then the tee-piece and backplate and the fitment screwed down to the bench by means of stout screws. To complete the job, a round piece of hardwood about 8 in. long is fitted tightly into the tee-piece and the projecting part made to fit the saddle tube of the cycle. This arrangement allows the frame to be adjusted to any desired angle and locked in position by the lock-nuts.

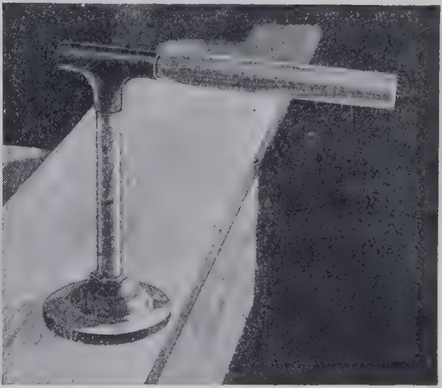


Fig. 1

In order to carry out the work methodically, all tools and accessories should be looked out at the beginning as much time will be saved by having things ready to hand.

The necessary tools include a hammer, shifting spanner, cone spanner, pliers, screwdriver, an old knife, a supply of old linen rags, emery paper, paraffin, petrol, vaseline and several old dishes or tins, a small stiff brush besides enamel or other chosen finishing medium and a brush with which to apply it.

The best way of tackling the dissembling is to suspend the machine from the ceiling of the workshop in the manner shown in Fig. 2, by means of a couple of stout cords fixed to hooks or screw-eyes, in which case the saddle pillar and saddle can first be removed as well as the brakes and handlebar. The machine may then be slung up as suggested, and the front wheel and mudguard removed. This should be followed by disconnecting the chain, taking off the chain wheel, pedals and cranks and then removing the bottom bracket axle complete with the cups and ball bearings. The front fork is the final item to remove from the frame. This is done by first unscrewing the ring or lock-nut that keeps the lamp bracket in position and then slacking the nut at the side of the head-clip, which should then just lift off. In removing the head-clip, care must be taken to support the fork in position or else the ball bearings, both under the fork and at the fork crown, are likely to fall out and be lost.

Fig. 2

To prevent loss of the balls when removing them from the bearings, it is a good plan to spread a cloth immediately below the parts being operated upon. It is important that cloth should be used and not newspaper as the former prevents the balls from rolling about.

Painting the Frame. — Before attempting to clean dissembled parts it is advisable to prepare the frame for finishing as attention to the other components may be given whilst the frame is drying.

To prepare the frame for re-enamelling, the whole of the metal must be scraped perfectly clean, following with the vigorous use of emery cloth of by the vigorous use of emery cloth of medium grit.

Suitable chemical paint remover is obtainable at moderate cost at most cycle dealers and its use eliminates tedious scraping. All that is necessary is to cover the surface of the old enamel with the medium, leave for a few minutes and then rub off all the old enamel. Paint remover can be used for cellulose lacquer and varnish with equal success, and has the advantage of being non-inflammable; it will not damage metal, as it contains no acids or alkalies, and will not harm the skin.

Having removed every particle of enamel and polished the frame with emery paper the metal should be rubbed over with a clean linen rag damped with a little petrol to remove any grease, which if allowed to remain would spoil the new finish. From this it follows that the subsequent handling of the frame before and when applying the new enamel should be done with a clean rag as bare hands are likely to be greasy.

At this stage the worker must make up his mind as to the kind of finishing medium he intends to use. A quick-drying spirit enamel is not recommended as it easily chips and scratches. Cellulose lacquer is excellent and so is good quality hard-drying enamel. In either case it is necessary to give the frame one or two undercoats before applying the final one.

If cellulose lacquer is the chosen medium it is important that the brushing kind be specified as similar lacquer is supplied for spraying on, which is unsuitable for brush work.

Special cellulose undercoating can be obtained and this is applied with a soft brush. Half a pint of cellulose undercoating and an equal quantity of the finishing medium will be ample for the frame including forks and mudguards.

Apply the undercoats and allow each one to harden before applying the next. In putting on the finishing coat, care must be taken to cover the surface as smoothly and quickly as possible as cellulose lacquer sets in a very short time and for this reason it cannot be touched up satisfactorily should any part have been missed.

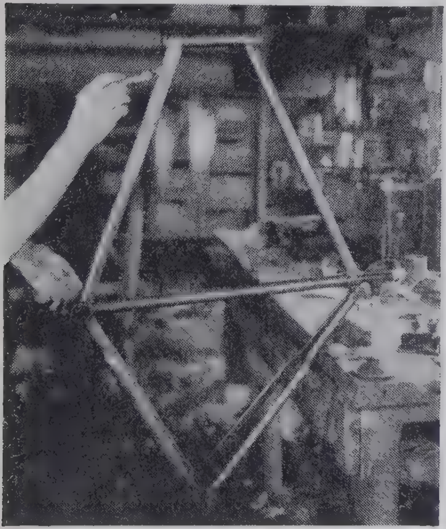


Fig. 3

If ordinary enamel is used, give the frame and forks two good undercoats of flat oil paint, rubbing down each coat when thoroughly dry with fine pumice powder and water before applying the next. The same applies to the outsides of the mudguards, but the insides should receive three undercoats as a preventive of rust.

The enamel should be flowed on carefully with a soft brush. The room in which the painting is done must be free from dust and at a temperature of anything above about 60 deg. F. Ordinary enamel takes about twenty-four hours to set. Fig. 3 shows the process of enamelling.

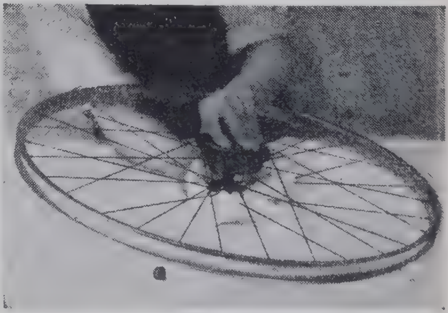


Fig. 4

Assuming that the plating of the handle bar, wheel rims and hubs, cranks and other plated parts is in a good state of preservation it may be cleaned, examined and adjusted. If the surfaces of these parts are in a dilapidated state and it is not considered advisable to have them replated they can be cleaned and finished as in the case of the frame and thus convert the cycle into an all-weather machine.

In making the necessary adjustments, a start can be made on the front wheel. This is best done by laying it flat on a bench or table, as seen in Fig. 4.

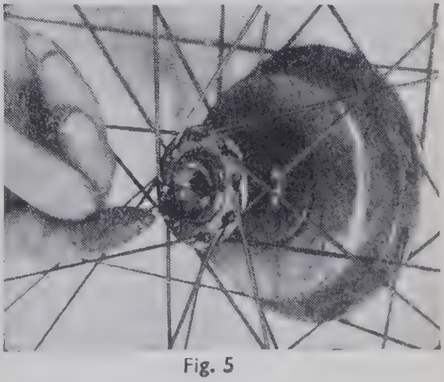


Fig. 5

Ball Races.—Unscrew the adjustable

cone, remove the balls and place them in a saucer of paraffin to remove dirt and grit. If any of the balls are pitted or misshapen it is wise to replace them with an entirely new set, and this applies to any other sets of ball bearings in the machine. Ball bearings are not expensive. If this is done, and provided that the ball races are in good condition, you are unlikely to experience trouble from this source for many hundreds of miles.

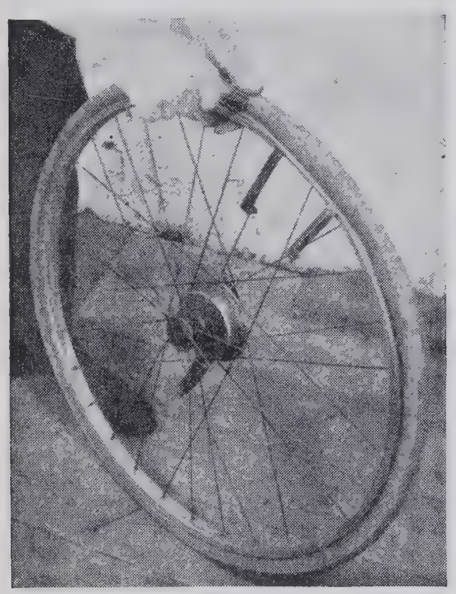


Fig. 6

If the balls are in perfect condition, they may be replaced into their respective races. This may appear to be a tricky job, but little difficulty will be experienced if a small quantity of vaseline or motor grease is first inserted into the races and the balls placed in position, as the balls adhere to the vaseline, which prevents them from falling out. This process is pictured in Fig. 5. The cone should be tightened up and then slackened off a quarter or half turn so that the wheel turns easily yet without any rock. The same procedure is followed with the back wheel, bottom bracket and pedal bearings, every part of which should be thoroughly cleaned with paraffin and polished with a clean cloth.

Clean the chain by allowing it to soak in paraffin, replacing the oil from time to time as the dirt soaks out of the chain. Clean the chain wheel with paraffin applied with a stiff brush. Then examine both by placing the chain over the wheel. If the chain does not bed down perfectly it shows that either the chain is stretched or the teeth of the sprocket are very much worn, or both.

The chain should also be applied to the small sprocket on the back wheel and if necessary all of these parts should be replaced. The cost will not be large. A good chromium-plated chain wheel with cranks and cotters can be obtained from a cycle shop or garage, as also can a free-wheel sprocket and a serviceable chain. This money is not wasted, as the proper functioning of chain and sprockets is all-important in easy riding.

If the back wheel is fitted with a three-speed hub it is unwise to take it apart as the mechanism is somewhat complicated. If anything is wrong with it, the wheel should be taken to a skilled cycle mechanic. No injury will be done, however, if the gear is thoroughly cleaned by squirting paraffin into the bearings via the lubricator.

The Tyres.—Mention has not yet been made of tyres. It may be that both covers are so worn that little remains of the treads, in which case both tyres should be substituted by new ones, not only because the life of such covers is nearly at an end, but because it is dangerous to use tyres in this condition. The tread is there to grip the road and prevent side-slip.

In the event of the front wheel cover

being in a good condition and the rear one being only slightly worn, the tyres should be reversed—that is, the rear cover should be fixed to the front rim and vice versa.

In these days the majority of tyres are of the wire-edged type, and to remove them from the rims a set of tyre levers of a suitable pattern will be necessary. To remove the cover, deflate the tyre by unscrewing the valve and insert the spoon-shaped end of the lever at one side between the cover and the rim, care being taken not to pinch the inner tube when so doing, lever up the wire edge over the rim and fix the cranked end of the lever to a spoke by means of the slot.

A second lever is then brought into operation a few inches from the first and secured to a convenient spoke, and then the last one, when the remainder of the edge of the cover can be pulled over the edge of the rim with the fingers. Fig. 6 shows the operation. Next remove the remaining parts of the valve and take out the tube. The opposite wire edge of the cover can then be levered off the rim.

An adjustable tape will be found at the bottom of the rim, so placed as to prevent the nipples at the ends of the spokes from chafing the inner tube. If the tape is very much discoloured by rust or is rotten, replace it with a new one, and if the inner tubes are stretched and thin it is wise to replace them.

In the event of a tube being punctured, proceed in the following way: replace the valve and partially inflate the tube and pass it inch by inch through water contained in a convenient bowl. The puncture will be revealed by the issue of numerous bubbles. The position should be marked and the remainder of the tube tested to make sure that there are no further leakages. Fig. 7 shows the method of locating the puncture.

To repair the puncture all that is necessary is thoroughly to clean the surface round the leak, apply a thin film of rubber solution to it and to a clean rubber patch, allow the solution to become tacky and then stick the patch over the defective part. The patch should be kept pressed to the tube for a few minutes to allow the solution to harden. To save time, this can be done with a spring clothes "peg" (see Fig. 8).

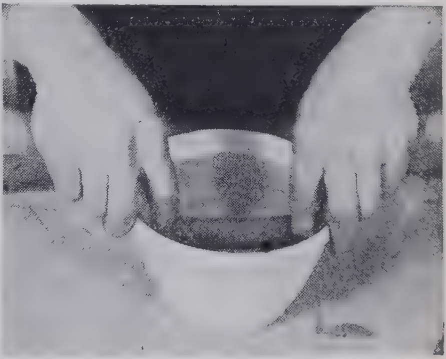


Fig. 7

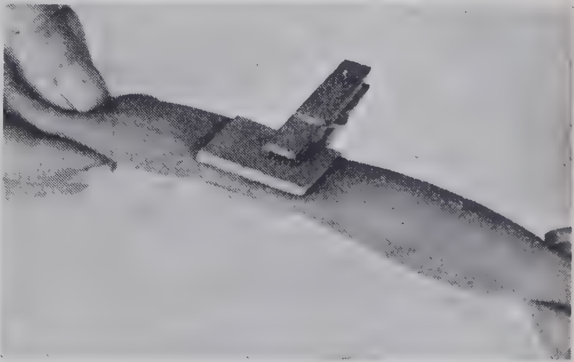


Fig. 8

Assuming that the tyres are now all right, new valve rubbers fitted to the valves, all parts perfectly clean and adjusted and the forks, mudguards and other re-enamelled accessories perfectly dry and hard, the machine may be reassembled in the following order.

First fit the bottom bracket cups and balls, using the vaseline method of securing the balls, as already explained. Then fit the chain wheel and cranks. Next fix the rear mudguard and rear wheel, chain and rear brake and follow by fixing the front fork, mudguard and wheel.

Before finally tightening up the wheels, make sure that they are running freely without shake and if necessary make adjustments. In fitting the front wheel be careful to see that the adjustable cone is on the left-hand side of the fork—that is, opposite the chain wheel.

If a three-speed gear is fitted, make sure that the indicator—which can generally be observed on the step side—is flush with the end of the projecting step when the lever is in the neutral position. Adjustment for this can be made by the gear adjuster on the opposite side. Before riding, all moving parts must be well lubricated.

CLEANING AND ADJUSTING A TYPEWRITER

The mechanism of a typewriter soon collects fluff and dust which mixes with the lubricating oil and makes the working parts stiff. It also clogs the type and becomes spread over the ribbon. Adjustments are not often necessary in the course of ordinary use and any but the simplest should be left to a typewriter mechanic.

Machines obtained from reputable dealers can be accepted as being clean and in working order. It is second-hand machines obtained by private purchase that require the most attention before they are fit to use.

Take as an example a very neglected machine. On trial, most of the letters and figures are found to be clogged, some are out of line and the whole machine coated in dust, eraser dust and sticky oil. The paper carriage has a very sluggish movement and is inclined to jump and thud as the keys are operated.

To put such a specimen in working order we shall require the following items:

A bottle of benzine.

A bottle of lubricating oil for typewriters.

A few fair-sized feathers and pipe cleaners.

Supply of rag that will not leave fluff behind.

An old tooth brush.

First Steps.—Remove the machine from its baseboard and place it on several thicknesses of newspaper. If in fair condition the ribbon need not be removed. Slip the paper carriage off out of the way. The method of securing this may differ with the machine, but in any case do not remove any screws or nuts; and this applies to all parts of the machine.

Carefully wipe off the worst of the dirt, going all over and inside the machine, taking care not to bend any of the levers. Having done this, proceed to a complete clean up, starting at the top.

A small wad of rag wrapped round a pencil or a knitting needle will be required to reach under some of the small parts and into openings. Damp the rag with benzine. Use a large feather or a pipe cleaner in the spaces more crowded with levers and type rods.

For cleaning the type a tooth brush moistened with benzine will prove the most effective, but it is also just as well to make sure of closed letters such as "e," "o," "p," "m," and all figures and fractions, by removing the dirt with the end of a match or a needle. Raise each character in turn by depressing the key and, supporting it underneath with a finger, thoroughly clean each type. This operation is seen in the figure. Clean the eraser dust from all the hinge ends of the type levers, and from the pad on which the type rests.

Testing the Keys.—Test the spring of each key and see that it returns without lagging. Slack ones are generally unsprung underneath, so turn the machine on its side and look for a small spring somewhere along that particular lever. The loose end of the spring can soon be reinserted in its proper fixing hole and the end bent round so that it will not slip out again. All should be examined.

Try the ribbon movement and, when near the end in one direction, replace the paper carriage, insert paper and type a few lines, watching the ribbon to see that it reverses of itself when the end has been reached. The mechanism for operating this differs with the machine, so note should be taken of a double pawl action on toothed wheels connected to the ribbon spools. The points of the pawls wear away with the action of the teeth on the wheel and fail to engage when operated into the change-over position. The only real cure is to obtain new ones.

To regulate the movement of the paper carriage, turn the tension screw a few times and then try it by typing a few words, but do not make the tension too strong or the reverse trouble will be noticed, that is, the carriage will move with a combined jump and thump as each character is used. To slacken the tension, find the pawl lever with a hook at each end engaging with a toothed wheel. Disengage the locked end and the toothed wheel will move round one tooth and become locked again by the other end of the pawl. Work this a few times and try it out. When the right tension has been obtained, do not alter this adjustment again. From the tension driving wheel there may be a band attached to the far end of the paper carriage, by which the latter is pulled along through the tension spring. This band may be worn and, if so, should be replaced by a new one but this is a job for the mechanic and repair shop.

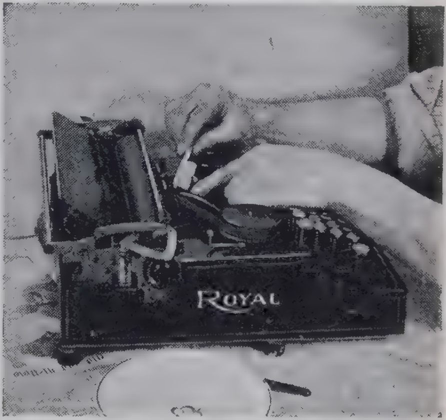


Fig. 1

The pawl of the ratchet feed which turns the paper up one, two or three line spacing may require replacement, also the small rubber rollers and guide slips holding the paper close to the roll.

SIMPLE BOOT AND SHOE REPAIRS

The essential tools for simple boot and shoe repairs include a metal last or foot, shoemaker's hammer, shoemaker's knife, rasp, sharpening tool, pincers, screwdriver and a finishing tool.

A serviceable last of the type that is shown at A in Fig. 1, can be purchased at most stores and a hammer B of special shape with a rounded face is also to be obtained.

A half-round rasp, indicated at C, measuring 8 in. long, and a screwdriver D and knife E are other necessary items. A finishing tool of special shape fitted to a handle, as at F, and 7 in. pincers G, which are quite large enough for general purposes, will complete the amateur shoemaker's kit of tools. With these it is possible to undertake all ordinary repairs. The sharpening strop is merely a piece of shaped wood upon the wide faces of which are glued or otherwise fastened strips of emery cloth, medium grade on one face and a finer grade on the other. This accessory is shown at H.

Leather can be bought either in small pieces or in larger quantities. It can be bought in several qualities, but it is false economy to use any but the best. A good piece of leather should be uniform in thickness, smooth on the fleshy side as well as the face, homogeneous in texture and it should not be possible to separate the layers.

There are two methods of re-soleing boots and shoes by hand, known as riveting and hand-sewing respectively. The former is the simpler. It is used principally for boots and shoes that have double soles. Hand-sewing is confined to welted footwear. A welted shoe cannot be riveted successfully as the sole is attached to the uppers by means of a narrow rim of leather or welt, as indicated in the diagram Fig. 2, which has not sufficient width to take rivets.

Rivet Soleing.—To re-sole a pair of riveted shoes, proceed in the following way. First fix one of the shoes upon the last and remove the bottom sole by inserting the blade of a screwdriver between the underside of the worn sole and the middle one at the toe end, and prise it up sufficiently to enable the pincers to be used in the manner indicated in Fig. 3. Do not lift the leather right back to the heel, but cut it across about ¾ in. from the instep. Remove any nails and skive or bevel the edge of the remaining piece so that it is flush with the middle sole, as in Fig. 4. Then smooth the face level with the rasp. If the middle sole is worn, place a piece or pieces of felt in the recess to bring it up level with the remainder.

The next step is to cut leather for the new sole. Use the old piece as a pattern, or make a paper pattern by placing the paper over the sole of the shoe and rubbing round the edges with the screwdriver so that it marks the outline of the shoe and then cutting round the outline with a pair of scissors. Another way is to use the fine side of the rasp which will automatically cut out the outline. Place the pattern on the face (dark) side of the leather, and with a sharp lead pencil trace a similar outline about ⅛ in. larger all round to allow for trimming after the new sole has been fitted in position.

Bevel the edge at the waist—that is, the end towards the heel—on the fleshy side of the new leather. This needs to be done with a sharp knife and finished off neatly with the rasp. Fig. 5 shows the first part of the operation.

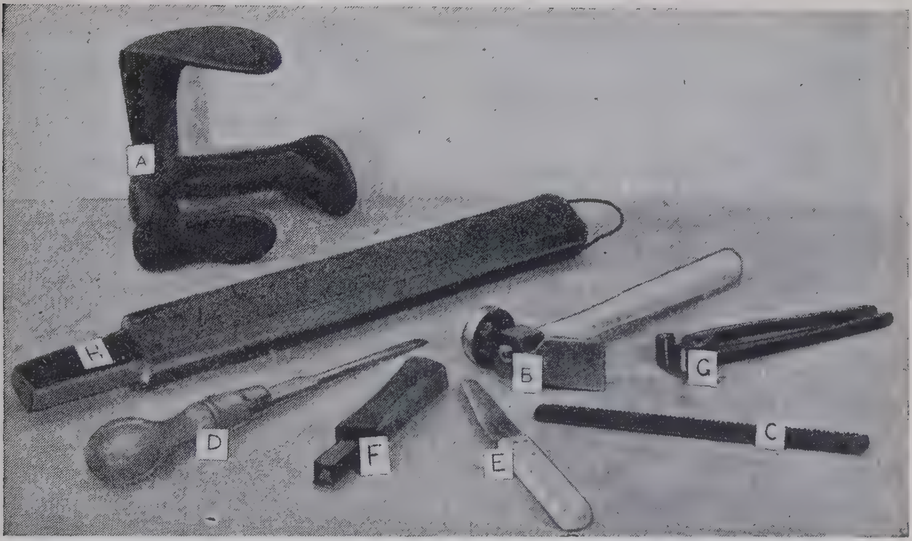


Fig. 1

Now place the roughly shaped sole into a bowl of water and allow it to soak for about ten minutes. Then place it on a flat piece of iron, fleshy face up, and hammer it well. Soaking the leather makes it pliable and easy to work, while the hammering closes the pores and increases the durability of the leather.

Replace the shoe on the last, put the new sole in position and fix it down by driving in a couple of rivets near each end. Now trim the leather to shape, as shown in Fig. 6. Keep the knife very keen and, if dull, give it a few rubs on the emery stick.

The sole is now ready to receive the rivets. The length of these is important. They should be long enough to go just through the leather of the sole and the shoe and to clinch the inner sole when driven well home upon the last.

The rivets should be spaced about ¼ in. apart at a distance of ¼ in. from the edge. It is a good plan for a novice to mark a guide line round the shoe before riveting. A little practice will enable you to judge the spacing of the rivets and so dispense with the guide line. Do not drive in the rivets vertically, but slope them slightly towards the centre of the shoe. Bent and defective rivets should be withdrawn.

Now hammer the heads of the rivets level with the leather and finish the edge, first with a rasp and then with a scraper. The latter can consist of the rounded end of an old table knife blade.

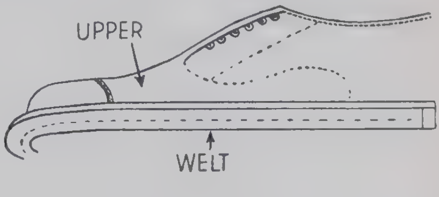


Fig. 2

Resole the other shoe and, if necessary, repair the heels. To accomplish this, remove the old leather and cut new top pieces slightly larger than the heel.

If necessary, insert thin slips of leather to bring the heel level. Rivet and trim as in soleing.

The final process consists of finishing.

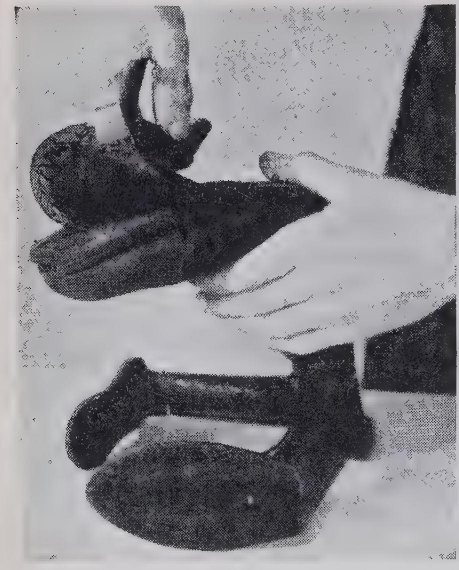


Fig. 3

Apply a coat of burnishing ink, sold in small bottles for the purpose, and allow it to dry. Then rub some heel-ball along the edges. Heel-ball is a black, waxy substance and needs to be slightly melted before use. Warm the finishing tool and rub it vigorously round the edges and then polish them with a rag.

Hand-stitched Soles.—In resoleing a pair of welted boots by hand stitching, remove the upper sole by carefully cutting away the stitches between the bottom sole and the welt and skive the end of the sole about 1 in. from the waist. Prepare the new soles as already explained.

Place the new sole on the shoe and secure it by partially driving in two or three rivets as indicated at A and B in Fig. 7. Shape the leather to the welt.

Now mark a line about $\frac{1}{8}$ in. from the edge all round and then cut a shallow channel with the knife held at an angle of about 30 deg. to the sole so that the bottom of the channel is further away from the edge than the top.

Open the top of the channel by raising the leather with the aid of either the screwdriver or knife, thus leaving a small ridge or lip of leather projecting above the face of the sole, as indicated in Fig. 8.

Next, with the blade of the screwdriver, make a very small groove at the bottom of the channel. This recess allows the thread to lie flush with the bottom of the channel and enables the leather lip to be hammered down flat after stitching.

The next operation consists of preparing a special strong, waterproof thread. Cotton thread is useless.

The thread comprises five strands of No. 17 hemp. Two such threads will be required, one for each sole. To make a thread, break off five lengths of hemp each about 5 ft. long and twist them together by first placing the middle of them over a nail in the bench and then rolling the strands down the knee with the palm of the hand. The ends of the thread should be tapered before twisting, and this is accomplished by placing the end of each strand about 1 in. or so from the next in the manner shown diagrammatically at A in Fig. 9.

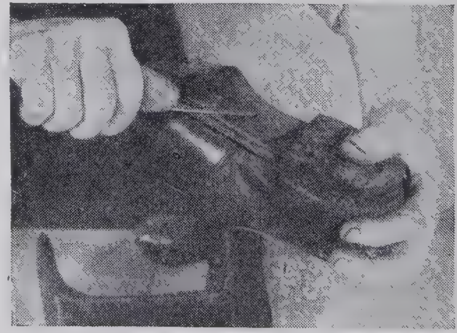


Fig. 4

The thread is then rendered waterproof by rubbing it thoroughly with cobbler's wax, previously softened by

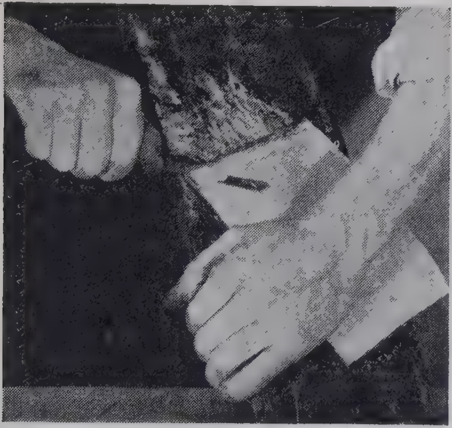


Fig. 5

rubbing it in the hands in the same way as one would soften putty.

Special bristles, obtainable for the purpose, are used in place of metal needles for sewing, four of these will be required, two for each thread. The bristles are pointed at one end and fibrous at the other, and they are attached to the thread in a special manner by first rubbing the fibrous end with cobbler's wax and then twisting the thread round the end as shown at B in Fig. 9. To prevent the thread unwinding, make a small hole in the thread, push the bristle through the hole and pull the thread tight. Fix another bristle at the other end, and repeat the process with the second thread.

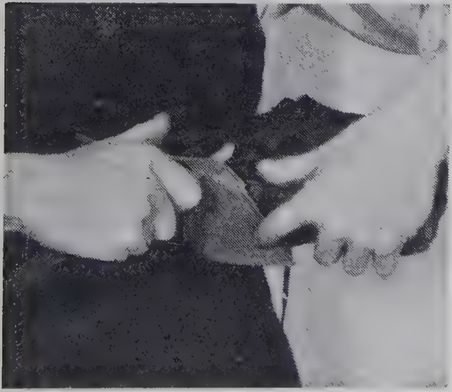


Fig. 6

Stitching.—The shoe is now ready for stitching. This operation calls for a shoemaker's awl, having a curved blade. Sit on a low chair and grip the shoe between the knees in the manner shown in Fig. 10. With the awl, make a hole large enough to pass the bristle and thread. The first hole should be made about ¼ in. away from the waist end of the new sole and the point of the awl driven in from the top of the welt into the groove in the channel.

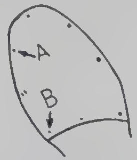


Fig. 7

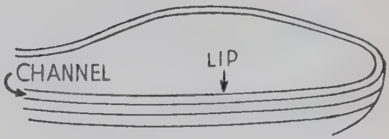


Fig. 8

Pass the thread through so that half the length of thread appears at each side. At a distance of about ¼ in. from the first hole, pierce another hole and push one length through the top to the bottom and the other thread in the reverse direction, that is, from the bottom to the top. This is shown at C in Fig. 9. Proceed in this manner round the sole, drawing the threads extremely tight at each stitch. At the end of the stitching, tie the threads together and cut off the remainder.

Place the shoe on the last and apply a thin film of rubber solution to the inside of the channel, allow it to get tacky, then seal the channel by running the back of the hammer over the projecting leather and finally hammer it down flat.

Withdraw the partially driven rivets except those at the waist. These are driven home, together with several others right across to form the joint.

Trim the edges of the sole and finish the work in the manner described for a riveted shoe.

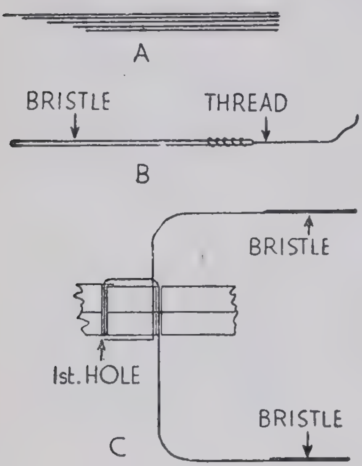


Fig. 9

Another satisfactory method of resoleing a welted boot or shoe is to weld or stick on the new sole.

Welded Repairs.—To weld a new sole to a welted shoe, first strip off the old sole as already explained, and cut the leather roughly to shape, not forgetting to bevel the waist end. With a rasp, hack saw blade, or wire brush, thoroughly roughen that portion of the face of the sole exposed after the removal of the old sole leather.

Roughen the fleshy side of the new leather and then apply a thin film of powerful rubber adhesive to the roughened surface of the new leather and the shoe. Such rubber adhesive can be obtained for about ninepence at most stores.

Allow the work to stand in a dry, dustless atmosphere for about twenty minutes, or until the white adhesive turns brown. Now place the two prepared surfaces together. This must be done accurately as the new sole cannot be removed once it is in position.

With a hammer, first gently tap down the centre in order to drive out the air, then treat the remainder in the same manner, especially at the edges.

Remove the boot from the last, place the edge of the welt downwards on to the edge of the iron foot and tap round again to ensure that the sole adheres closely to the welt, thus sealing the joint and making it watertight.

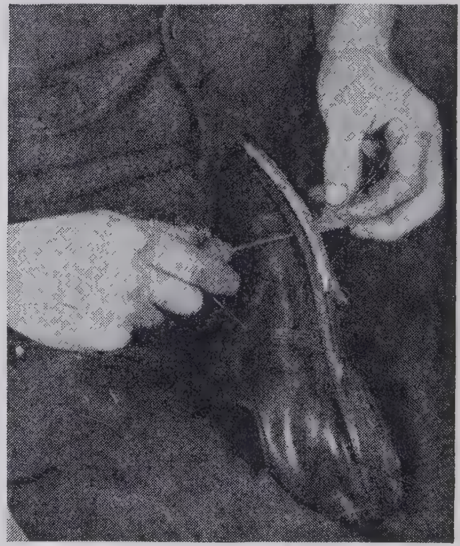


Fig. 10

Rivet across the waist in the usual manner and anchor the sole at several places by driving in a rivet here and there at a distance of about $\frac{3}{8}$ in. from the edge.

The shoes can be worn immediately after resoleing.

The best way to fix a rubber sole to leather is to roughen the old leather with a rasp, apply a film of rubber solution and put the shoe aside for an hour or two to allow the solution to soak in and get dry. Then place the shoe over the last and tap the prepared surface. Apply another thin coat of rubber solution to the shoe and also apply a film of solution to the new rubber sole. Allow sufficient time for both to get tacky; carefully place the new sole in position and allow the work to dry. If a rubber sole is needed on a new leather sole, roughen the leather first and proceed as above. Rubber heels are fixed by special nails.

HOW TO MAKE AND FIX AWNINGS

COOLNESS inside the house, and a shady retreat outside, necessitate two different types of blind. There are many varieties of each, but the making and fixing of two kinds which are described here are both simple and in normal times cheap.

A certain amount of ingenuity may have to be exercised in coping with the difficulties regarding supplies which may have arisen through the period of short supply.

The type of cloth which normally might be used for awnings, and which it was possible to obtain anywhere at reasonable rates, may not for a time be so easy to acquire. It is for each individual to decide how far the amenities of his house and garden justify the expense and, perhaps, trouble, involved in providing awnings under present conditions.

First we will deal with the awning type of blind, the kind which can be erected outside the house, against any sunny wall, window or door to form a shady arbour, as illustrated in Fig. 1.

The size of the awning naturally depends on the needs of the user, but for most purposes a spread of some 9×7 ft. will be found convenient. Striped canvas of any kind will serve, preferably waterproof. Heavy, unbleached calico may be used and is quite cheap.

Assembling Materials.—All the edges of the canvas or calico should be trimmed and hemmed and, if desired, a valance can be cut along one of the long edges to form an ornamental finish for the front.

In addition to the cloth there will be required a length of stout board, preferably beech, 4 in. wide × 1 in. thick and 1 ft. longer than the longest edge of the material (in this case the board would be 10 ft.); two poles about 6 ft. 6 in. high and of 1 in. diameter, fitted with metal ferrules and spikes at each end, and a pole also 1 in. in diameter and the length of the proposed awning, fitted with metal ferrules and metal eyes at each end; two pegs, guy ropes and toggles and four brass hooks and corresponding eyelets.

Fixing the Top.—The board or batten is fixed to the wall at the chosen spot at a height of about 8 ft., by means of plugs and screws. Do not use nails. The brass hooks are screwed into the board at regular intervals, the outer hooks being 7 in. from the ends of the board respectively, as shown at A in Fig. 2. The four eyelet holes are then attached to the material on the longest length (previously hemmed) to correspond.

An alternative method of fixing the top of the awning would be to use a further pole the length of the awning, of about 1 in. diameter and fitted with metal ferrules and metal spikes. A screw-eye at one end and a hook at the other are substituted for the four hooks

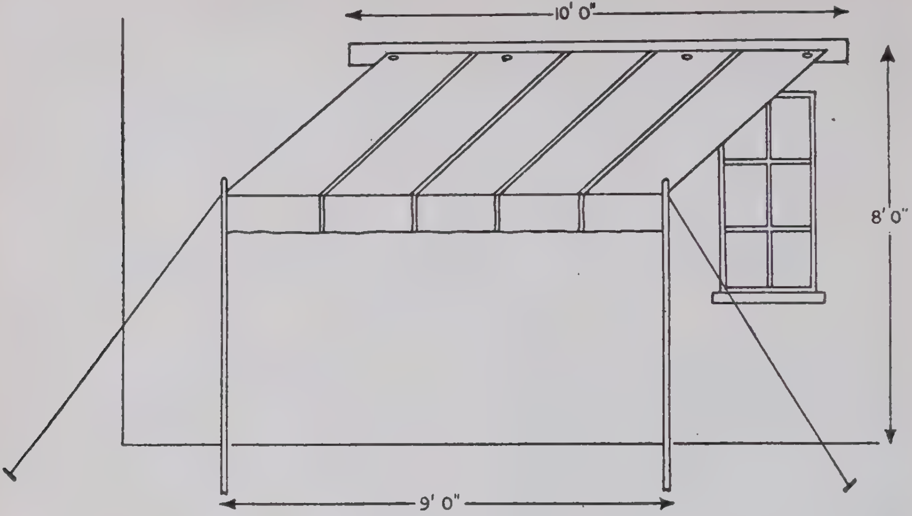


Fig. 1

on the wall board. The material is then glued round this roller and nailed, and the roller is slipped into its bearings. This method of fixing provides a more finished job. The arrangement is depicted at B in Fig. 2.

For the front fitting the other corresponding roller is used. This roller, it will be remembered, is fitted with metal eyes, which are meant to slip over the spikes on the upright supporting poles, as indicated at C in Fig. 2. The material may be fixed to the front roller or not, but for ease of fixing and rolling the blind after use it is better to have the material fixed.

This may be best done for a pole of 1 in. diameter by scoring two lines $3\frac{1}{7}$ in. apart on the upper surface of the cloth about 9 in. from the valance in the manner indicated at D in Fig. 2. The cloth is then strongly gathered together, folding it so that the lines meet on the upper side, thus making a tunnel on the underside into which the pole may be slipped and secured with galvanised tacks.

It is possible to dispense with the bottom roller (especially if a roller is used on the wall fitting) and the cloth may be fastened by means of eyelet holes which are slipped over spikes on the supports. But without the bottom roller there is bound to be some sagging and flapping.

The upright supports are merely fixed in the ground at the required distance and the loops of the guy ropes slipped over the spikes. If desired, these spikes can be finished off with a shaped finial. The toggles are slipped over the two pegs, and the awning should be perfectly steady and stable.

If poles and guy ropes do not appeal, a more ambitious awning can be made as illustrated in Fig. 3. Instead of the upright poles, wooden struts about 1 in. square and fitted with ferrules and metal eyes at both ends are used.

Supposing the height of the top batten has been fixed at 8 ft., then fix to the wall directly below each of the outermost metal hooks on the batten two blocks of beechwood, 8 in. long × 4 in. wide and $1\frac{1}{2}$ in. thick. To the exact centre of each block, screw a metal eye the same size as those on the struts.

When you want to fix the awning in position, the metal eyes on the base of the struts and on the boards are placed in juxtaposition and a wooden peg, fitting tightly, is knocked through both as at A in Fig. 3. The struts are then pulled down horizontally and the front roller, which has been fitted with spikes instead of eyes, is slipped in. The ends of the spikes on this roller must be fitted with finials or some sort of caps after they have been slipped through the eyes in the struts, or the roller will tend to fall out (Fig. 3, B). For this awning, too, the cloth must be fixed to the roller, so that the whole construction is mechanically knit together.

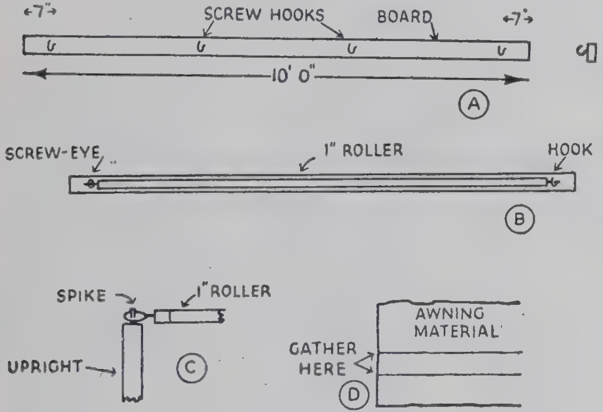


Fig. 2

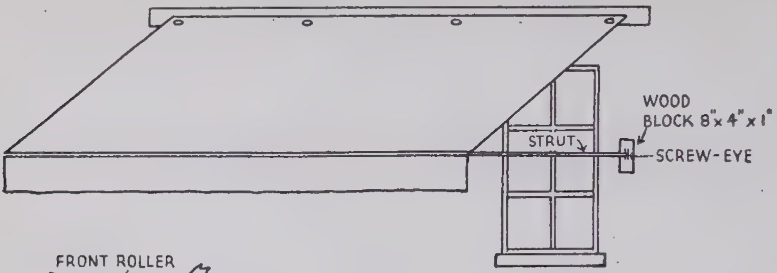
Sunblinds.—So much for the outside awning. The sunblind for shading the interior of a room is different, and one of the simplest, lightest and most compact is the Japanese reed blind, represented in Fig. 4.

Materials are two battens as long as the blind will be wide (and the width will, of course, vary for different purposes), about 1½ in. wide and ½ in. deep; a number of screw hooks and metal eyes; some small brass pulleys and an amount of thin cord and a considerable quantity of thin bamboo shoots or stout reed stems. Thin wood will, of course, do, but it is more expensive.

Take one of the battens and fix in it, on one of the ½ in. edges, two metal eyes, each about 4 in. from the ends. Fix one of the pulleys at right-angles to the length, as at A in Fig. 4.

Now take a quantity of bamboo or reed, cut to the length of the batten. Cut a piece of adhesive tape, such as that used by electricians, of the length you require the blind to be, place it flat on the bench or table, and carefully spread along its length the pieces of reed or bamboo at not more than ⅜ in. apart. Now take some broad white tape or webbing about three times the length of the blind, and at one edge, about 4 in., start to bind the lengths together with a basket weave. When you reach the end, carry on back so that the slats are held together tightly. Repeat this at the other edge, fastening off the tape by gluing it round itself. Now take a further piece of 1½ in. batten for the base, fix in the centre another pulley B, Fig. 4, and attach the completed screen of reeds to the laths. This can be done by nailing or binding with waterproof tape.

Rolling Up the Blind.—The only remaining operation is to fix the cord. One end of the cord is first nailed to the back of the upper batten, and it is then brought round through the lower pulley, up the front of the blind and through the pulley at the top, threading through from the front to the back. Now if the cord is pulled the blind will roll up into a compact cylinder. The arrangement of the cord is shown at C in Fig. 4.



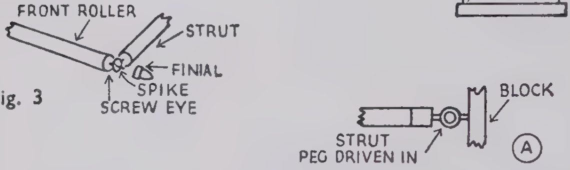
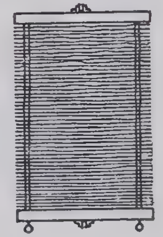


Fig. 3

The whole screen is attached by means of the metal eyes to brass hooks inserted at the top of the window or door it is desired to cover.

The making of this screen may seem laborious, but the result is worth the trouble. Painted once a year, screens made in this way will last a considerable time, and they do not split or warp, are very light and simple to fix and handle. The cost is small, especially if you happen to live in a district in which you can gather your own reeds. Dried and painted river reeds are quite satisfactory.



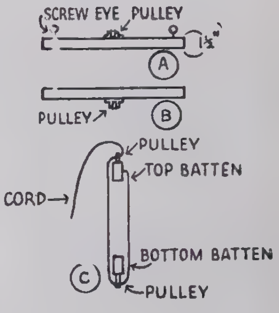


Fig. 4

A useful sun curtain for protecting the front door consists of striped material as used for the awning cut to fit the doorway. The edges are machine stitched and the top hem is provided with brass curtain rings. These slide along a piece of electric light tubing, suspended between two adjustable brackets or screw-hooks above the door.

CLEANING AND REPAIRING LOCKS

It is not hard to understand the working of lock mechanism, for in the main the locks with which we are familiar are of simple types. Inside the house, for instance, two types are generally fitted: two bolt mortice locks on the main doors and two bolt rim locks where appearance is not important. In either type there is a latch bolt operated by a handle from either side and a dead bolt operated by a key.

Mortice Locks.—The usual type of latch bolt (which is the bolt operated by the handle) is made to slide and is bevelled. This bevel is carefully computed to strike the plate fixed to the door frame easily and efficiently whether the handle is operated or not. Careful adjustment of the bevel has its disadvantage, however, in that if anything becomes slightly misplaced owing to warping the bolt will not act.

When this happens it will usually be found that the striking plate has shifted owing to warping of the wood or loosening of the screws. When the wood has warped the plate must be taken off, the original screw-holes plugged with wood, the correct position carefully computed, and the new fixing made. With the plate in position again it will be an easy matter to adjust the striking hollow with the aid of a sharp chisel.

This, of course, applies to mortice locks only. It will rarely be found that the iron angle plate of a rim lock manages to slip out of position sufficiently to hinder easy working. If it does happen, usually all that is required is to tighten up the screws that have worked loose.

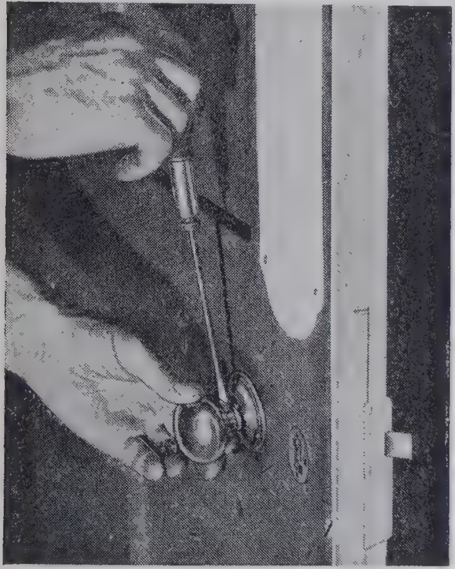


Fig. 1

Loose Handles.—The only other fault which can arise on the outside of an ordinary lock is the annoying tendency of handles to work loose. Here again the cure is simple. Tighten the screws which hold the handle to the shaft, as indicated in Fig. 1. In chronic cases of handle rattle, it will sometimes be found efficacious to change the handles round, pressing them as tightly as possible against the boss plate whilst rescrewing.

Before we proceed to the interior of the lock it may be remarked that, as a general rule, oil should be used very sparingly. A drop on the spindle holding the handles and another on the latch bolt (applied when it is fully extended) is occasionally beneficial, whilst the dead bolt should be wiped with an oily rag, but not plastered with grease.

Inside the Lock.—The same rule applies to the interior. If a bolt acts stiffly or harshly it does not need oil but cleaning. To clean a mortice lock, the screws on the door edge must be loosened and the lock drawn out of the door as a whole, as shown in Fig. 2, when it will generally be found that one side is easily removed, as in Fig. 3.

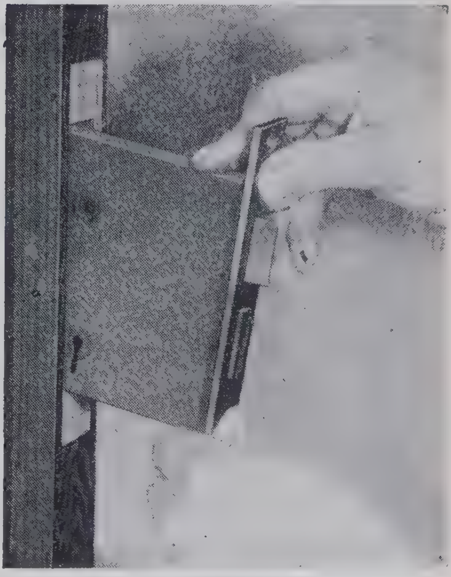


Fig. 2

A rim lock is easily unscrewed, after first removing the handles.

It will be found that the mechanism of the lock consists in the main of the following parts: a crank operated by

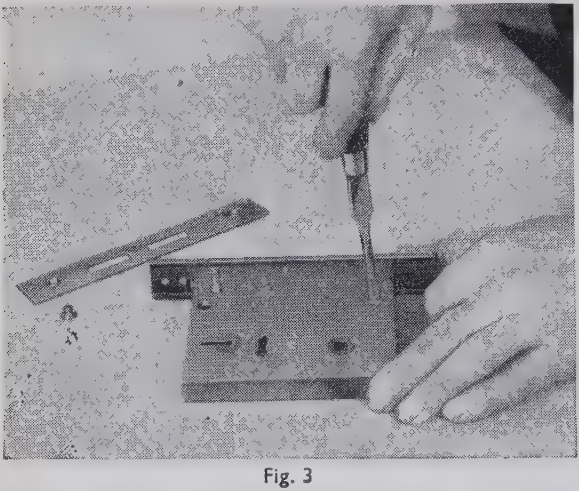


Fig. 3

the door handle, a follower that imparts the thrust to the latch itself and a spring usually of the helical or coil compression type. In some old locks a V-spring may be found. In most cases of stiffness it will be found that the follower is choked with dirt. This is best cleaned out with a hard hair brush of suitable size dipped in petrol.

It is rarely that the spring is damaged, but if it is a locksmith had better be consulted. As a temporary measure, it may be found possible to fit the spring on to the stem of the latch bolt. A makeshift spring can easily be made from a section of an old clock spring.

When the key refuses to turn in a lock, or when the dead bolt is stiff or jammed, dirt will probably be found to be the cause again. Dirt reaches the key wards easily, and also tends to jam the slotted arm which controls the dead bolt. If the wards are bent it should be possible to straighten them by tapping very lightly and carefully with a hammer.

Rust.—One of the greatest enemies of lock mechanism is rust, which is introduced to the inside of a lock through the key. The only cure for this is to take the lock to pieces, carefully noting the various positions and interlocking connections of the crank and spring, and take the rust off the affected parts with emery cloth. Then it is advisable to soak all the working parts in petrol for two or three hours, afterwards drying them thoroughly before they are replaced. The spring can be thoroughly soaked in a good light oil.

In most modern houses the lock fitted to the front door is of the cylinder type, Fig. 4, working through tumblers connected with the key plug. If any fault develops in a lock of this kind the key itself should be examined first to see if it is bent or cut, as the lock depends for its operation on the key being perfectly true. If the fault is in the lock itself it should be handed to an expert, for cylinder locks are very delicately adjusted. Rub the key of a cylinder lock

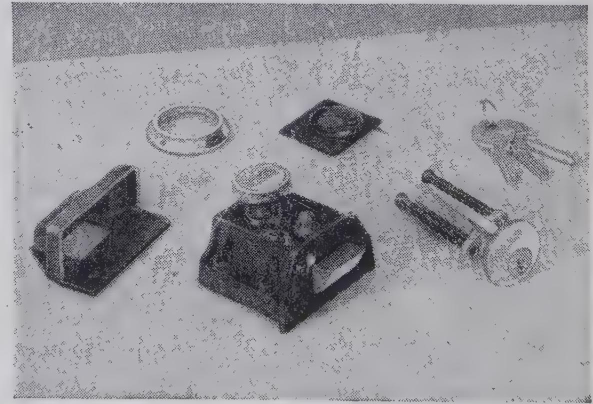


Fig. 4

occasionally with a paraffin rag, and it will be found that trouble rarely occurs. In any event, if the key sticks, do not try to force it, as this will damage the lock itself. The safe course is to keep both keys and locks clean and firmly fixed. An inspection of all locks in the house might be made once every six months when any slight fault that has appeared can be remedied.

CLEANING AND PRESSING CLOTHES

THE premier cause of shabby clothes is lack of pressing or improper pressing. Let us take as an example a suit which requires pressing and cleaning. Make sure that the iron is clean; even an electric iron can gather dirt on its surface and do damage to an article.

A level and clean surface must be obtained by covering a table or board with cloth. An old sheet over an old blanket can be used and kept especially for the purpose.

Sponging and Spotting.—The garment is laid flat on this cloth. If it is the trousers, see that the legs are lying along the proper creases as indicated in Fig. 1. Make sure there is no dirt or dust on the garment, brushing the cloth vigorously with a hard brush. This operation is depicted in Fig. 2.

Then take a sponge, dipped in lukewarm water and squeezed until just moist, and sponge the garment thoroughly.

If there are grease spots, they will need separate treatment. Apply petrol or benzine with a clean rag. Rub it well in, and let it dry. Turpentine can be used if quite pure. Another method of removing grease spots is to place a piece of unglazed brown paper over the spot and press with a hot iron. If the spot remains, treat as follows. Drop on to it a little oil of tartar, and immediately wash with lukewarm water and then with cold water. Salt of wormwood which has been left in a damp place until liquid, and used in the same way, is also good. If both methods fail, it generally indicates that the spot is indelible, although treatment will cause it to fade considerably.

The results of careless wear of the trousers must be attended to before the pressing is done, or the garment will have to be pressed again.

A seam which has begun to split should be resewn carefully. If left it will extend until a tailor will be necessary. Do not just sew the seam from the front, but examine the underside of it, see how the tailor has done the work and follow this as closely as possible.

Invisible Mending.—A tear is more serious, especially if the edges are ragged or threadbare from neglect. If the edges are strong and clean, the tear can be neatly darned to make the join as invisible as possible.

The method shown in Fig. 3 should be used for a ragged tear. A piece of material of similar colour and texture is placed beneath the tear. The ragged edges of the tear are then cut away, and the clean edges left are turned in and sewn on to the material underneath. Surplus cloth is then cut away and the repair is complete.

Frayed trouser edges and turn-ups can be temporarily repaired with a needle and thread, the frayed edges being drawn together and sewn over. A cross-stitch should be used.

When all spots have been cleaned, tears renovated and all frayed edges trimmed, pressing may be done.

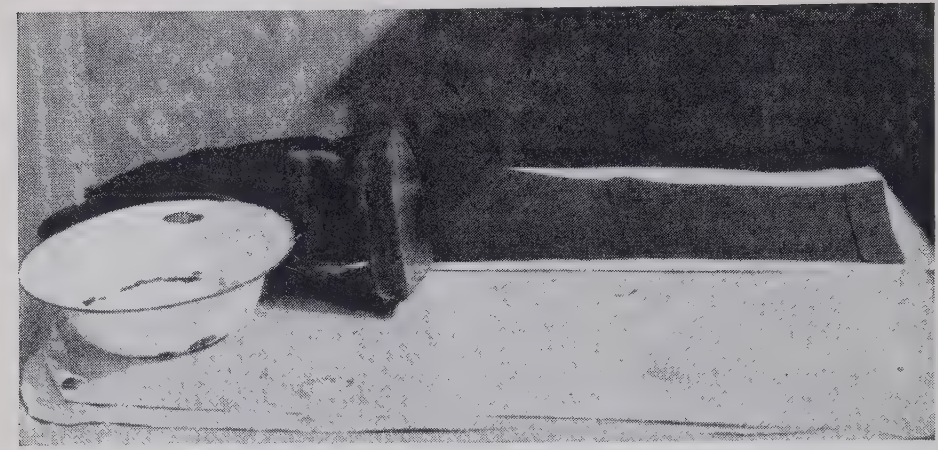


Fig. 1

Make sure the iron is the correct temperature. If it is not hot enough, it will be ineffective; if it is too hot, it may scorch the material. Test the iron by dropping a spot of water on to the surface. If the bead of water slides off easily and rapidly, the iron is at the right temperature. If it sticks, it is not hot enough; if it disappears in steam, the heat is too great.

Take a clean cloth and place it into lukewarm water. Any cotton or linen square will do, or an old shirt can be used. Leave the cloth to soak for a few minutes. Then wring it out and lay it upon the garment as indicated in Fig. 4. Make sure that the garment lies perfectly flat beneath the cloth.

Never put an iron into direct contact with worsted, tweed or flannel or similar fabrics. Ladies' garments of light texture can be ironed and pressed this way, but not men's clothing.

Pressing.—The correct way to press is to lay the iron on the part required and lean heavily on it. Never bang the iron downwards with the idea that

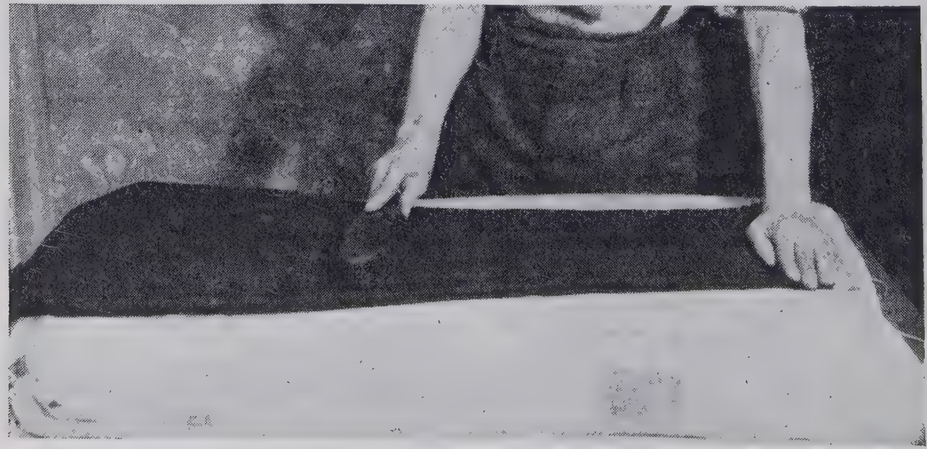


Fig. 2

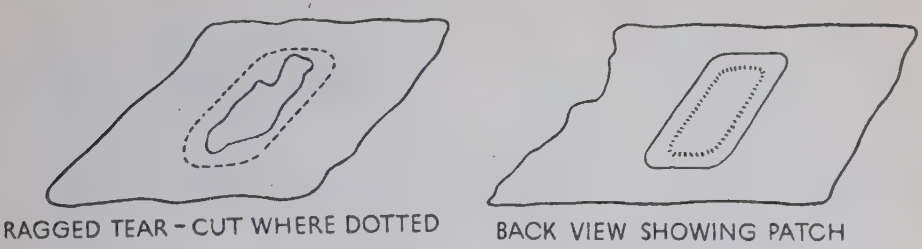


Fig. 3

you are applying weight by so doing. It is pressure that counts. Any creases to be made should be attended to first, the material pulled taut while it is being pressed. The covering cloth should be just damp enough to produce a sizzling noise when the iron is applied.

When the clothes have been thoroughly pressed, change the damp cloth for a dry one and iron the garment again with a smooth sliding motion.

If you omit the second iron and dry cloth the garment will ruckle and pull out of shape quickly.

When pressing light - coloured materials, never let the iron linger long in one place. It may be too hot and then a scorch will result, even through a covering cloth.

Shine on dark-coloured cloth of close weave can be removed temporarily in the following way. Sponge the shiny area with a weak solution of vinegar, and allow to dry. Apply the vinegar again, and then press lightly with a very hot iron and a dry cloth.

Never press a garment with anything in the pockets. Ridges and marks will result, which are very hard to remove.

For removing ink stains and liquid marks, a dilute solution of ammonia is useful. Warm the affected part before applying the ammonia, and let it dry thoroughly before ironing.

Unless a garment is very light in colour, do not use soap and water to remove a stain. The mark will certainly be partially removed, but a light patch will be left where the soap and water were applied.

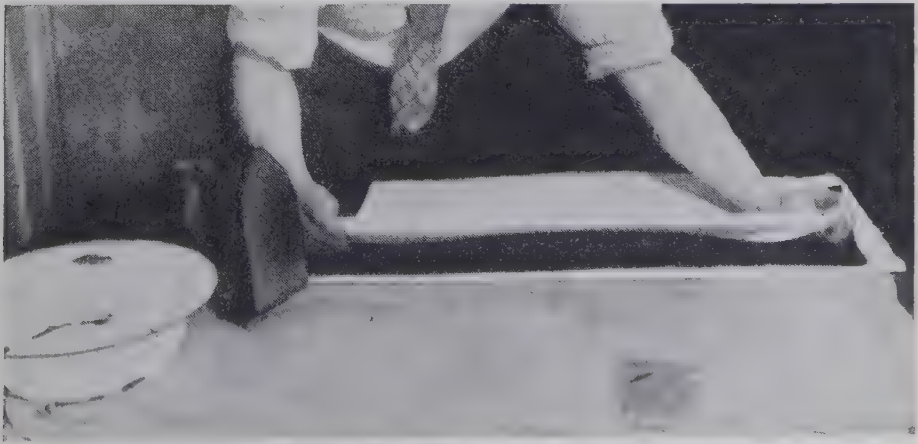


Fig. 4

Button Sewing.—A button is simple to fix. Buttons are provided with eyes, and a needle carrying cotton is passed through the cloth and these holes alternately. When the button has been firmly fixed, the needle should be brought through the cloth without being passed through the button and the cotton wound round and round between button and cloth. The needle is then passed back, another stitch or two made, and the cotton cut as illustrated in Fig. 5.

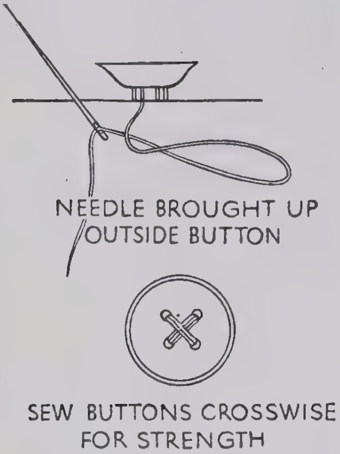

NEEDLE BROUGHT UP OUTSIDE BUTTON
SEW BUTTONS CROSSWISE FOR STRENGTH

Fig. 5

If possible, a suit should always be kept in shape by laying the trousers in a press, Fig. 6, when not being worn and hanging the coat on a hanger. If a suit smells musty after some time of disuse, clean it with petrol and dry in the open air. Paint can also be removed with petrol and turpentine.

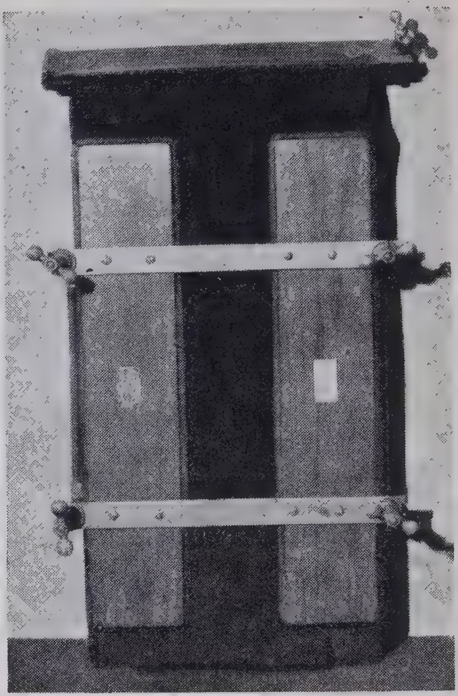


Fig. 6

NEW LIFE FOR THE CARPET

Daily brushing keeps the pile free from grit and dirt. Places which are in continual use wear quicker than the rest of the carpet. To avoid uneven wear as much as possible, a carpet should be taken up and relaid in a different position about once a year.

When a carpet has worn in patches, treatment must be given. If the carpet is a cheap one, it may have faded, but usually this faded look is due to dirt. Test this by cleaning a small patch with benzine and comparing it with a part which has been covered by furniture.

Beating and Brushing.—Faded or not, the carpet must be taken up to make a thorough job of its rejuvenation. If you have a lawn, spread the carpet out. If not, hang it over a stout cord and leave it for a few hours in the sun. Beat it thoroughly with a broad, flat object until the dust which rises is so fine that it can hardly be seen. Then brush thoroughly, first of all with a hard brush, and then finishing with a softer one.

A lot of hair may come away. This is a sign of a good carpet and is usually only loose strands of wool. If the beating has been done well, the carpet is now clean, but still has not the fresh, new appearance which is to be desired. The best way to obtain this is to brush the pile thoroughly with a soft brush dipped in petrol, as shown in Fig. 1. Benzine is better if you have enough. The smell will disappear if the carpet is left out in the air for a few hours.

Obstinate spots should be sponged with a solution of ammonia, three parts to ten of water. Do not use a strong solution, as ammonia has a bleaching action. The use of ordinary carpet soap is not advised, at least for thorough cleaning, as it contains alkali and is apt to shorten the life of the carpet.

The next step is to go over the carpet and see if repair is needed anywhere. If the carpet is a seamed one, signs of wear may have appeared along the line of the seam. The best way to remedy this is to cut the manufacturers' seam and resew with carpet thread, drawing the selvedges right back before commencing the operation.

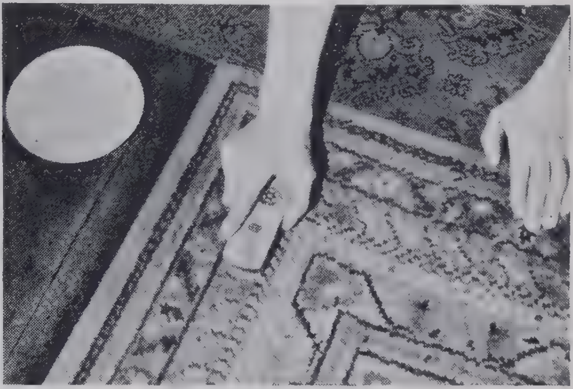
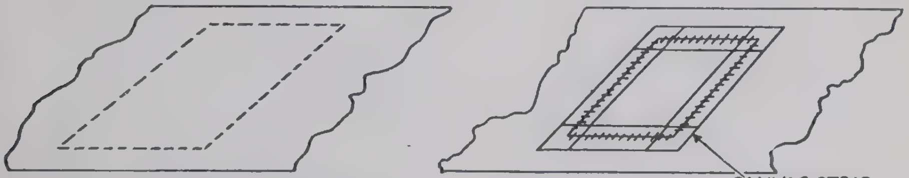


Fig. 1



DOTTED LINE SHOWS HOW REGULAR CUT SHOULD BE MADE IN CARPET.

REVERSE, SHOWING PATCH IN POSITION

Fig. 2

Patching.—Bare patches worn in a carpet can be treated in two ways. With a self-coloured carpet, it is possible to pick up remnants of rugs of the same colour very cheaply. In this case, cut out the bare patch, canvas and all, with a sharp pair of tailors' shears, to an even shape and convenient size. Cut a piece from the remnant exactly the same size, and sew the piece into the original carpet from the back, using a lock-stitch. Stitch a broad strip of stout canvas over the seam at the back, fastening the patch securely into position.

It is imperative, when making a repair of this kind, to cut the worn patch into a convenient shape and large enough to take away the whole of the worn portion, Fig. 2.

When it is impossible to obtain

pieces of matched material, a more tedious repair is necessary. The repair will be of two types, depending upon the kind of carpet. In Fig. 3 there is shown roughly, the construction of three main types of carpet: Brussels, Wilton and Axminster. It will be seen that the first pile is looped and that the other two are tufted.

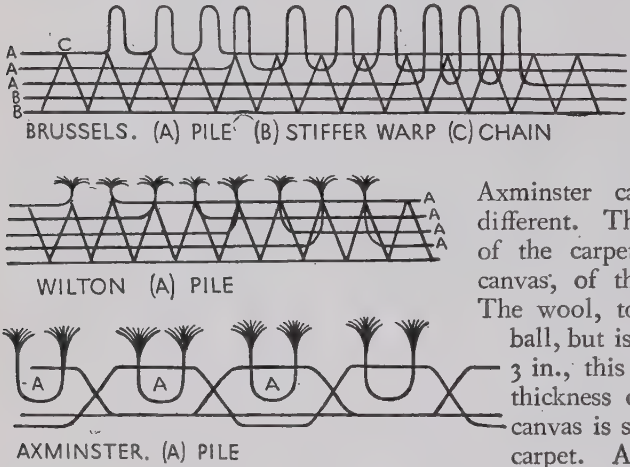


Fig. 3

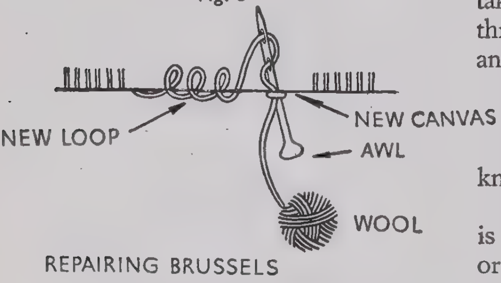


Fig. 4

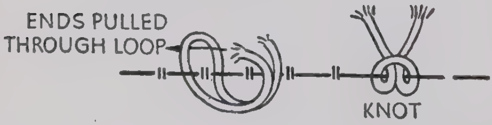


Fig. 5

If the original canvas remains good, this can be used in repairing a Brussels carpet. If it is badly worn, a piece of harn, hessian, burlap or packsheet must be stitched into position to form the backing. Obtain wool of the required shade and consistency and, as in rug-making, prod the wool through the canvas from the back, catching each loop as it is made with the left hand Fig. 4. No tying or knotting is necessary, and although it is not possible to reproduce the original structure of the carpet with its chain, warp and backing a neat repair can be effected.

Special Repairs.—In the case of Wilton and Axminster carpets, the procedure is different. The original canvas backing of the carpet cannot be used, as rug canvas, of the net type, is required. The wool, too, is not used from the ball, but is cut into lengths of about 3 in., this length depending on the thickness of the carpet pile. Rug canvas is sewn across the hole in the carpet. A length of wool is then taken and doubled. The loop is pushed through one of the holes in the canvas and held with the finger or a knitting needle. The two free ends are then brought through the adjacent hole, passed through the loop, and the knot pulled tight Fig. 5.

When the hole is covered, the surface is clipped down to the level of the original carpet. If the hole is a small one, and in an out-of-the-way position, it will generally be sufficient to use wool of the predominant colour of the carpet for filling, without attempting to reproduce the design.

If all gritty substance is cleaned out frequently the life of the carpet will be much greater. Tobacco ash is more beneficial than harmful. Never use a hard soap; or powder cleaner.

When a carpet smells, it is usually due to damp. Apply an antiseptic to the canvas backing and dry thoroughly in the air.

A stair carpet wears on the nose of the stair very quickly. Shift the carpet up or down a few inches now and then. Make sure the felt underneath still covers the nose.

Black spots and black lines sometimes appear across the width of a carpet, especially with Wiltons, probably due to internal oil. Apply benzine frequently until eradicated.

COMMON HOUSEHOLD APPLIANCES: THEIR CARE AND ADJUSTMENT

Domestic appliances are, on the whole, strongly and simply made, but they do wear out and go wrong, especially if they are neglected or ill-treated.

The Mangle.—Although it is seldom that any parts of a mangle get broken, quite often the rollers or the gears or the turning wheel become stiff and troublesome.

This is due to many causes, but mainly to excessive damp or dirt. If it can be avoided, never keep a mangle where clothes are boiled or where quantities of steam or condensed moisture are generated. Rub the rollers of a mangle after use with a dry cloth, and oil the gears with thick lubricant, periodically.

If the mangle does give trouble, it is best to take it to pieces and clean it thoroughly. This can be done quite easily if the following directions are observed.

First of all loosen the tension spring by means of the pressure handle seen at the top of the illustration Fig. 1. Next release the upper holding-down bolts, lift off the stretcher (which is a loose casting) unscrew the wheel-guard, lift off the sliding bar and then the upper roller.

Next remove the driving wheel and withdraw the washer and split-pin holding the intermediate gears in place and take off the lower roller. Be careful not to lose the split pins.

Take off the wooden trays, unfasten the nuts of the tie rod and the bottom casting, and only the iron side frames remain. Clean the frames thoroughly with an oily rag, brushing out all dirt from the bearing notches. If it is decided to paint the frame do this now. Scrape off all the old paint and then use a good pigment ground in oil thinned with a mixture of japanner's gold size and turpentine. Let the frame dry thoroughly.

Give all metal parts a thorough cleaning, paying particular attention to the oil holes in the bosses of the wheels, etc., provided by the manufacturer. Use a hairpin or a piece of stiff wire for this. Wipe all gears and the bores of wheels with an oily rag. Clean any rusty parts with emery cloth and wipe over with oil.

The Rollers.—If the rollers are badly worn, they should be replaced by a professional as the average amateur cannot tackle this job.

If the rollers are only slightly roughened by wear they can be smoothed by vigorously rubbing them down with glass-paper Nos. 1 and 0.

The most satisfactory way to do this is to replace the rollers in their bearings and revolve them, meanwhile pressing the glass-paper against the roughened surfaces after assembly.

When reassembling the mangle, oil all bearings immediately the spindles have been slipped in. Rotate the rollers several times after oiling. When bolting up the machine tighten all nuts gradually and equally.

The teeth of the gears can be lubricated with a little animal fat, but use only a small amount and wipe off any surplus immediately. When refitted go over the whole machine, dropping oil into the holes provided and paying special attention to the pressure pads and spring.

The rollers can be rubbed with a little linseed oil to give them a finish, but the mangle must not be used for several days afterwards.

If possible, keep the mangle covered when not in use, and oil it once at least every two months.

The Washing Machine.—The same general remarks apply to its care. Oil, however, should not be used as it may seep into the machine with consequent damage to the clothes.

When a washing machine begins to run stiffly, the following procedure may be adopted. Remove the operating handle by unscrewing the collar. Then unscrew the top cover which, in the case of most machines will reveal the gearing. If the gearing is situated in a metal chamber surrounding the handle stem, it will be possible to unscrew the whole box. The gears should be taken out and wiped with petrol.

A slight amount of vegetable fat (never any mineral lubricant) should be applied before returning the gears. A ball-race is found on the spindle of many modern washers and this should be handled very carefully.

It is important to keep the agitator of a washing machine free from the slightest trace of dirt. If through any cause the agitator becomes roughened this must be attended to at once, and if it is enamelled and any chip or break occurs the whole bar should be flaked and re-enamelled.

A Wringer is usually fitted to a washing machine, or this may be installed separately. Rubber rollers are usually fitted. The machine shown in Fig. 2 illustrates this. These are apt to become spotted and they can be cleaned with a little petrol. After cleaning a rubber roller with petrol, wipe with a cloth moistened with dilute solution of ammonia to make certain that no grease still adheres.

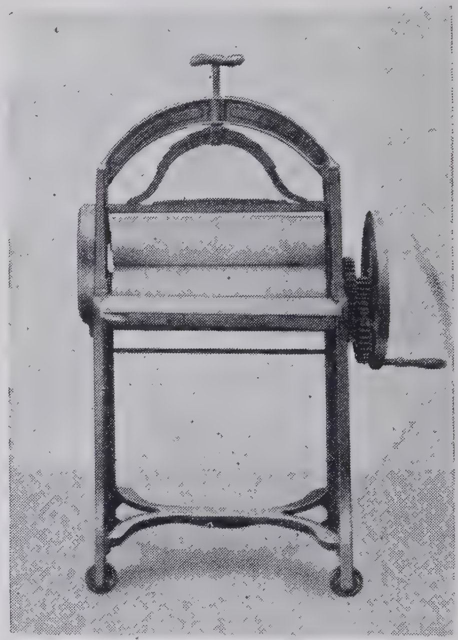


Fig. 1

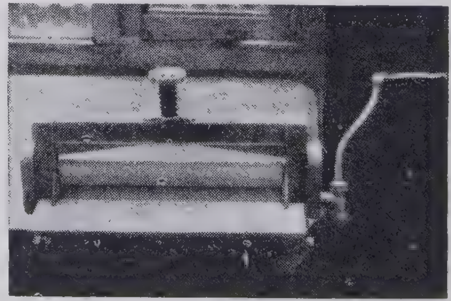


Fig. 2

If the rubber rollers of a wringer need replacing it is often found that the old shafts can be used. The wisest course is to send them to the manufacturer who can generally be relied upon to effect the repair.

A Carpet Sweeper should always be emptied of dirt immediately after use, and should it be used several times without emptying a bicycle pump can be employed to blow it clean inside.

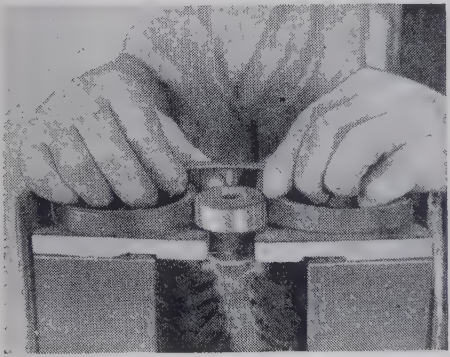


Fig. 3

One of the frequent causes of trouble with a carpet sweeper is the clogging of the brush and brush bearings, with strands of cotton, carpet hairs, etc. To clean these parts thoroughly the brush should be taken out of its bearings.

To clean the brush use a piece of damp rag, wiping the hairs of the brush from the base outwards.

It will usually be found that the brush spindle is held in position by pegs fixed to two metal bands which span the sides of the sweeper, and is rotated by the rubber-shod wheels which transmit the driving force. Force out the metal bands in the manner shown in Fig. 3. The brush can then be quite easily lifted out of its chamber.

If you find that insufficient power is being transmitted to the brush to pick up dirt properly, the defect is probably caused by the driving wheels having become loose. These wheels are not attached to the body directly but revolve on spindles running through the machine. The spindles are suspended from springs situated at the sides as indicated in Fig. 4, as well as by internal springs. The best plan is to unscrew the springs and bend the ends slightly more together.

If the release mechanism jambs, it is probably due to the screw of the lever having rusted slightly. This screw should be taken out, cleaned, oiled and replaced. The elbow joint of the release mechanism should also be oiled.

A carpet sweeper cannot, of course, be kept free from dust. The very nature of its job is a dusty one. To obtain the best results from the carpet sweeper, however, it should be cleaned inside periodically, all choking material removed from the brush spindle and a spot of oil dropped on the spindle itself.

The Non-electric Vacuum Cleaner.—Two types are in use, one in which the compression and expansion of a bellows is used to suck up the air, the other in which a revolving fan is used, driven by the sweeper when being pushed along the floor.

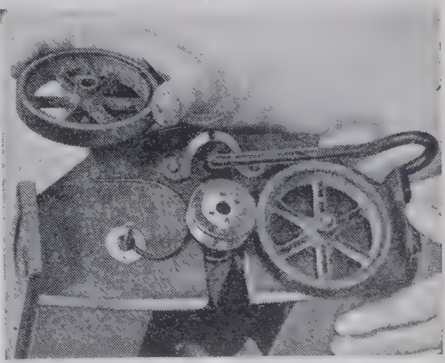


Fig. 4

The former kind is practically obsolete, and the latter is a well-made mechanical apparatus requiring very little attention. The main points are to keep the fan clean and well oiled, as well as the gears. If you possess the type in which a revolving brush is incorporated as well, see that the brush is kept clean.

Should there be any loss of efficiency in one of these sweepers due to a worn or badly fitted bag nozzle, cut a circle of thin rubber of the same size as the nozzle and screw or clamp this on with the rest of the fitting. A hole in the bag should be mended from inside, using a cycle-type patch or by sticking and sewing on some stout, finely woven canvas using small regular stitches.

SHARPENING AND REPAIRING DOMESTIC EDGED TOOLS

THREE general methods are used to sharpen an edged tool, such as scissors, knives, shears, scythes, etc. In each case the tool is rubbed at a proper angle on one of three substances—stone, emery or steel.

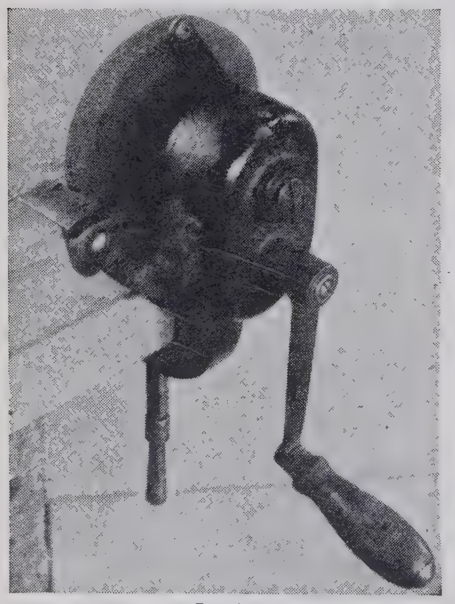


Fig. 1

The main requirement for successful sharpening lies in the use of the correct angle for the tool concerned. It is obvious that if the edge of a piece of metal is rubbed against any of these substances, at varying angles, the edge will be alternately sharpened and blunted, the net result being only to wear the metal away. Whereas if the correct angle is used all the time, the sharpening process will be cumulative.

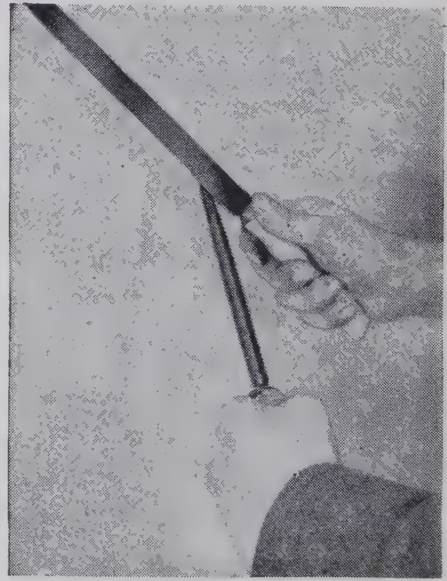


Fig. 2

It is possible to judge the correct angle at which to sharpen a tool by the angle ground upon it by the makers.

Grinding is only resorted to when the tool has a badly serrated or dented edge which it is necessary to cut away. Grinding is accomplished by either a revolving wheel with a circumference composed of carborundum or emery, or a wheel consisting of a softish stone.

Small hand-driven emery wheels, such as the one illustrated in Fig. 1 are sufficient for the amateur needs.

When grinding a tool with an ordinary grindstone make a point of having sufficient water, but if using an emery wheel do not use any lubricant, and follow closely the original angle of the bevel.

Remember that whatever tool is being ground or sharpened, one direction only must be used for each side of the edge. Rubbing a pen-knife backwards and forwards upon an oil stone so that one side of the edge is alternately pushed and pulled will not sharpen it.

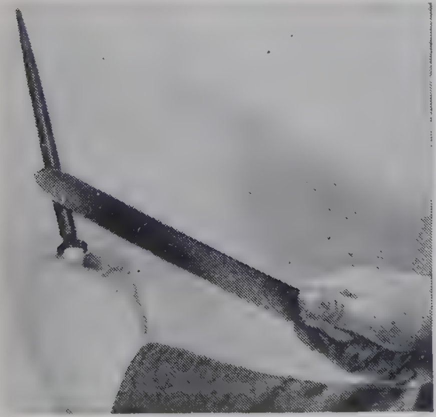


Fig. 3

Sharpening a Carving Knife.—The best method is undoubtedly by the use of a steel—either plain or ribbed. The edge of such a knife is continually being blunted by contact with hard tableware, etc., and constant use of the steel should be made in order to keep the edge keen. The correct method is shown in Figs. 2, 3 and 4.

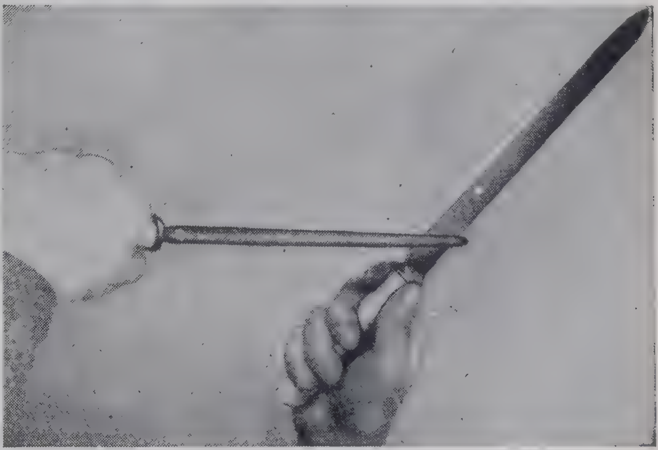


Fig. 4

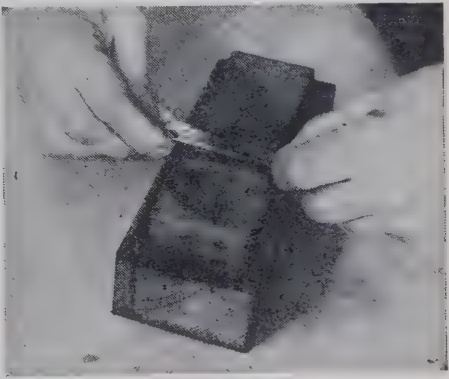


Fig. 5

A practical demonstration can be had by watching any butcher sharpen a knife. Butchers always use a steel and it is noticeable that their knives are always keen. It will be seen from the illustrations that two directions are used in moving the knife along the steel.

First the heel of the blade of the knife is pressed against and near the point of the steel, as indicated in Fig. 2, and drawn towards the handle of the latter, the tip of the blade being gradually pulled towards the operator as the stroke proceeds until it comes to rest in the position shown in Fig. 3.

Again following the butcher's practice, the next stroke is made by placing the knife at the back of the steel as demonstrated in Fig. 4 and repeating the manœuvre. By this means both edges of the knife are stropped once alternately, and this method is superior to stropping the knife several times on one side and then turning it over.

Table Knives may be sharpened in the same way. A common fault is for the blade to come away from the handle, the tang, as it is called, having become loose in the cement through continual immersion in hot water. The handles of knives should not be put into hot water when being washed. If necessary the tang can be recemented into the handle as follows: Mix four parts resin, one part beeswax and one part plaster-of-paris. Resin and white sand—or resin, beeswax and silica—will serve (powdered glass can be used for silica). Introduce the powder into the hole in the knife handle, heat the tang over a flame and press. Bind the blade to the handle with electrician's tape.

Scissors.—Keen edges are useless unless the two edges of the blades co-operate properly. It will be noticed that if a pair of scissors is held up sideways, the blades are bent in a curve towards each other and that in the operation of cutting the blades actually cross, the cutting part being the joint of contact which moves outwards as they are pushed together. Scissor-blades must be sharpened equally on one side only. If the scissors do not cut properly, examine the blades to see if they have been bent straight or away from each other. To bend back, heat with a flame and use pliers and a vice.

The angle of sharpening should be about 40 deg. from the horizontal. Sharpen each blade equally along the edge all the way. Unscrew the pivot screw and treat each blade separately on an oilstone, or if the blades are riveted together hold the scissors as shown in Fig. 5.

The scissors' joint should be oiled frequently. If the joint becomes loose, tap the rivet with a hammer. If the scissors are screwed, tighten the screw.

Shears, Scythes, etc., should be sharpened with a dry honing stone, sold for the purpose, the stone being run along the edge of the tool.

A loose locking nut of shears can be remedied by placing a small washer between the nuts and tightening it.

PHOTOGRAPHIC APPLIANCES

Amateur photographers will find the developing bench represented in Fig. 1 and working drawings, Figs. 2, 3 and 4, quite easy to construct.

The bench is built in the form of a table, at the back of which are three shelves for accommodating items such as bottles of chemicals, clock, measuring glass, thermometer and the usual items that comprise the developing equipment.

All parts are screwed together for two reasons. First, the use of screws reduces the amount of constructional work to a minimum without sacrificing strength and, secondly, screws enable the bench

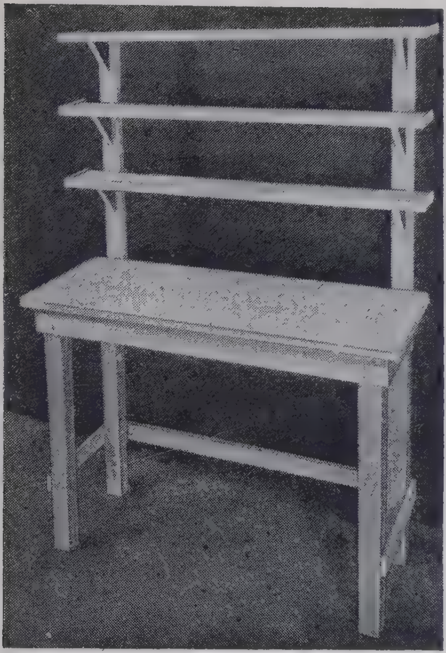


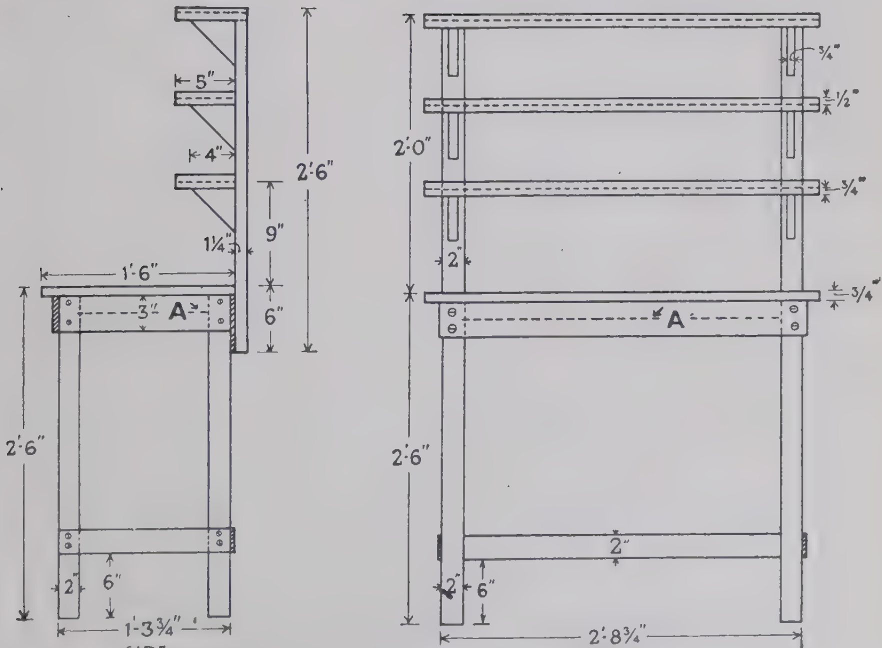
Fig. 1

to be taken apart and stored in a small space.

In order to save the table top from liquid stains it should be protected by a suitable material. Linoleum answers the purpose, but white glazed tiles make an excellent surface.

For the former, the bench top should be planed on both sides, but it will be better, with tiles, to leave the upper face unplaned as the comparatively rough surface will give a more satisfactory key to the glue with which the tiles are fixed.

The bench top measures 3 ft. long × 1 ft. 6 in. wide and may be constructed by fastening one or more boards together by means of cross-battens $1\frac{1}{2}$ in. wide × $\frac{3}{4}$ in. thick, screwed from the underside, to obtain the width, unless a single piece of $\frac{3}{4}$ in. thick whitewood is used, which eliminates the use of battens. The top member is fixed to the top rails that

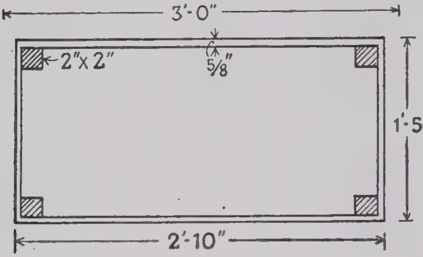


SIDE FRONT

Fig. 2

support the legs by means of $1\frac{1}{2} \times 1$ in. battens, as indicated by the dotted lines at A in Fig. 2.

A Tiled Top.—If glazed tiles are used, those measuring $6 \times 6 \times \frac{1}{4}$ in. thick, will answer the purpose admirably. Eighteen tiles will be required. Obviously, the plain patterns will be quite suitable; it will be quite unnecessary to pay for those bearing ornamental designs



ARRANGEMENT OF LEGS

Fig. 3

The tiles are simply glued into a shallow tray formed by screwing narrow fillets of wood to the edges of the bench top, details of which are clearly shown in Fig. 4.

As the edges of the tiles should butt together as closely as possible, it is a good plan to place them temporarily in position on the bench top before trimming the latter to size, marking the top and then finishing it to size, after which the fillets can be screwed to the edges.

The fillets are $\frac{3}{8}$ in. thick and 1 in. wide and project $\frac{1}{4}$ in. above the wooden face of the bench top so that the top edges of the fillets are flush with the tiled surface.

To fix the tiles, prepare some casein glue and soak the tiles in warm water so that they do not chill the glue when lain on.

Brush some glue on the underside of a tile and also on the table top at the position where the first tile is to be fixed. Stick the tile down and proceed with the next and so on until the whole of the tiles are fixed, tapping each one down on its bed of glue as the work advances so that they are quite even. Allow the glue to harden for a day and then fill the interstices with plaster-of-Paris and water mixed to the constituency of cream.

The Bench.—The legs and rails which support the bench top are sawn and trimmed to length, care being taken to see that the ends are square. Screw-holes are bored in the rails and the rails screwed to the legs by means of $1\frac{1}{2}$ in. No. 8 iron screws having countersunk heads. Fig. 3 shows the arrangement of the legs and rails.

Having assembled the legs and rails, fix the table top by driving screws through the projecting battens on the underside into the inside faces of the top rails.

Now prepare and fix the back supports. These are 2 ft. 6 in. long × 2 in. wide and $1\frac{1}{4}$ in. thick and are screwed to the back rail and legs as shown, a small block of wood $\frac{5}{8}$ in. thick being inserted between the supports and legs to give extra stability.

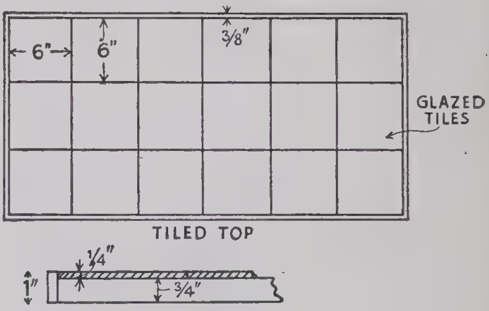


Fig. 4

If the top is tiled, the front of the supports will have to be recessed $\frac{3}{8}$ in. deep to clear the back fillets of the tray.

The top shelf is screwed into the top of the back uprights and is supported on a pair of 4×⅜ in. triangular wooden brackets, as shown. The other two shelves are also supported on similar brackets, all of which are fixed to the uprights by screws driven in from the back.

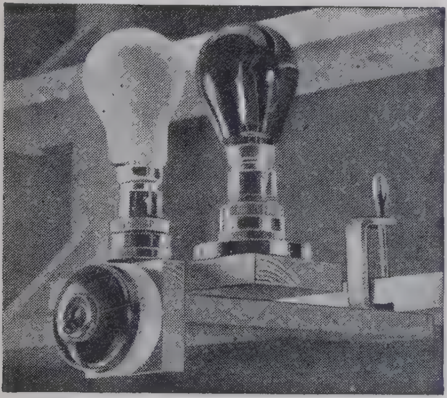


Fig. 5

In order to prevent bottles and other equipment from slipping off the shelves, wood fillets ¼ in. thick are bradded to the edges all round.

Lighting Details. — The illustration shown at Fig. 5 represents a useful darkroom electric-light fixture suitable for use with the developing bench previously dealt with.

As will be seen, the fixture is provided with two lampholders—one for accommodating a ruby or dark green lamp bulb for use when developing, changing plates or films, and other processes demanding such lights, and the other for taking an ordinary lamp for general lighting purposes.

The lamps are so arranged that they operate from a single two-way switch which is fixed in front of the fitting, as shown in the constructional drawing Fig. 6.

The holders are of the batten type and are mounted upon hardwood or deal 6 in. long × ½ in. thick which is screwed at right-angles to an arm consisting of a piece of wood 9½ in. long and ½ in. thick. At the other end is screwed a light metal woodworker's cramp, as is shown in Fig. 5.

The method of wiring up the lampholders and switch is shown at A in Fig. 6. One end of a twin flexible cable is connected to a lampholder adaptor, while one wire is connected to the common terminal of the switch. The end of the other wire is connected to one terminal of each lampholder, the connection between the two holders being carried out in a short single piece of flex. Pieces of single flex connect the remaining unoccupied terminals of the switch to the corresponding terminals of each lampholder.

Before attaching the fitting to the top shelf of the developing bench, it will be necessary to make a recess in the front fillet to enable the arm to lie flat on the top of the shelf.

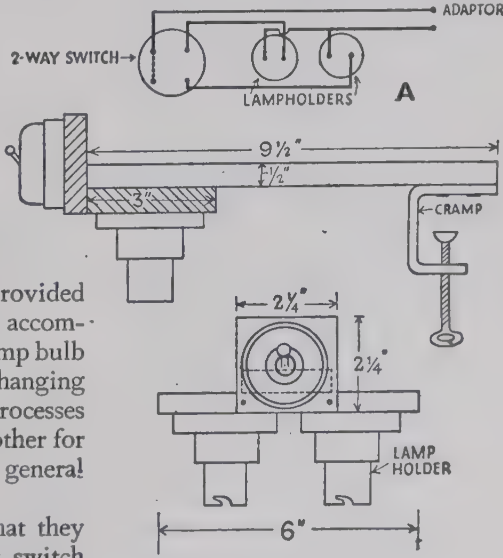


Fig. 6

A Floodlight.—The adjustable floodlight fitting illustrated in Fig. 7 will appeal to those who do photography by artificial light.

The top portion, A in Fig. 8, carrying the lampholder and reflector slides into the lower part B, the former being kept at any desired position within its limits by means of a peg inserted into one of a series of holes in the latter.

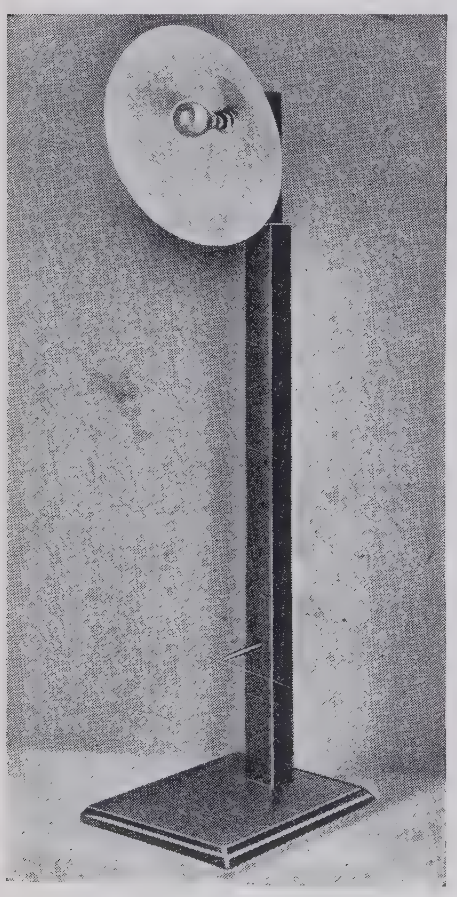


Fig. 7

The lower member is 3 ft. long and is built up of strips of hardwood $\frac{3}{8}$ in. thick, in the manner indicated at C in Fig. 8. The strips are simply screwed together and fixed to a deal base measuring 15 in. long × 12 in. wide and 1 in. thick.

When planing the strips, make sure that the edges are quite square with the faces or trouble will be experienced when fitting the upper sliding member A. The latter must also be square, and should be planed so that it is a good sliding fit in the tube.

Before assembling the tube, bore a series of holes $\frac{1}{4}$ in. diameter at convenient distances apart in either the front or back strip. These holes are for accommodating a 4 in. length of $\frac{1}{4}$ in. in diameter dowel or a piece of hardwood shaped to these dimensions. The lower end of A rests on the peg and keeps it at the desired height.

The sliding member is morticed on the front face at a distance of about 1 in. from the top, to receive the end of a piece of hardwood 1 in. wide × $\frac{1}{2}$ in. thick. This piece of hardwood is glued into the mortice and is attached to the lampholder base by means of a bolt and wing-nut which allows the lampholder to be tilted up or down and locked in position.

The mounting or base for the lampholder is merely a piece of wood 3 in. square × $\frac{3}{8}$ in. thick at the back of which is fixed a slotted piece of hardwood 1 × 1 in. and about 1$\frac{1}{2}$ in. in length, as shown at D in Fig. 8.

A suitable reflector, shown dotted, can be cut from a piece of plain white cardboard and the edges fastened together with paper fasteners or glue.

The base is a piece of deal 15 in. long × 12 in. wide and 1 in. thick. The upright is set back from the front edge, as shown to prevent the standard from tilting forward due to the weight at the top.

There are several methods of attaching the standard to the base. One way is to glue a block of wood into the bottom of the tube and fix the base to it by means of long screws driven in from the underside. Another method is to mortice the base and glue the end of the standard into it. Yet another way is to use plain iron brackets.

One end of a suitable length of twin flexible wire is connected to the lamp-holder and the other to a plug holder or lamp-holder.

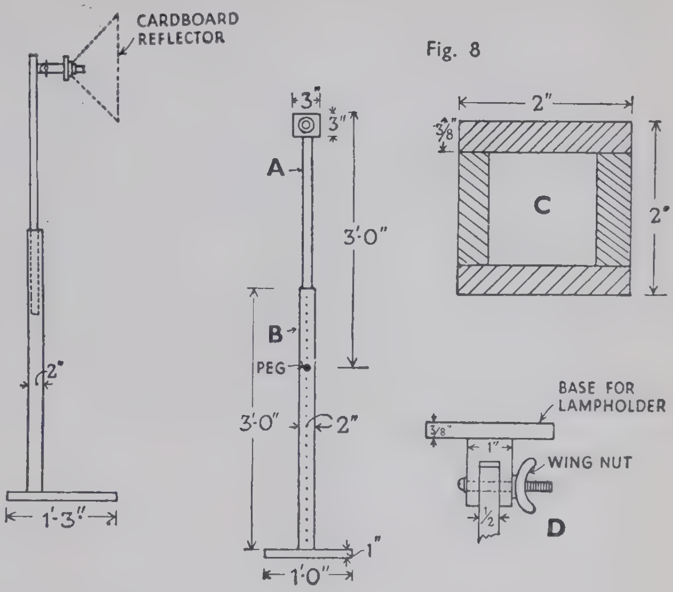


Fig. 8

CLOCK CLEANING

The untrained amateur with some knowledge of mechanics, good sight, patience and light fingers can be successful with the cleaning and adjustment of clocks. But whereas the clock is a necessary part of the equipment of practically every house and is, therefore, one of the objects which may suggest itself most readily for the experimentation of the handyman, nevertheless the clock, with its delicacy of mechanism, should be handled with proper care. Therefore, it is best for the layman to restrict his efforts to cleaning, as described in this article. Otherwise it may prove in the long run when a breakdown of the enthusiastic amateur's efforts has to be admitted and a professional called in, that some easier object might have been better chosen upon which the home worker could exercise his budding talents. This need not be read as an unnecessarily pessimistic estimate of all amateur efforts in clock-repairing, but only as a word of warning based upon the knowledge of how many of the inexperienced have failed to realise their hopes, and have been confronted with a mass of wheels, screws and springs which their utmost ingenuity could not lure back to their proper places in the clock's scheme of things. Watches are best left to those who have specialised training. Watchmakers' screwdrivers of two or three sizes, fine pliers, camel hair brushes and forceps are the necessary tools. An eyepiece is an advantage. A saucer of petrol is used for cleaning metal slime off the bearings, the dirt being dislodged with one of the brushes. For wiping, a piece of soft silk or cambric will serve provided it does not shed fluff.

Work under a good light on a firm

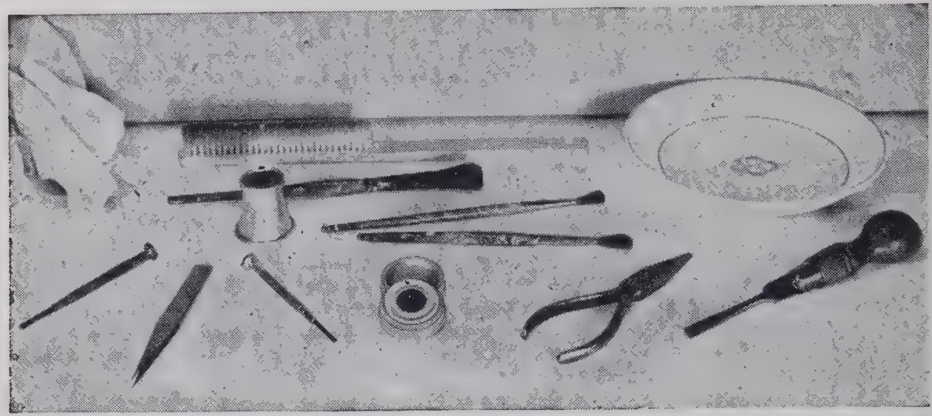


Fig. 1

table covered with white paper so that small parts may be easily seen. Fig. 1 shows the necessary tools and accessories.

Careful Oiling.—Use nothing but clock-oil. Ordinary machine-oil is quite unsuitable. Leave no vestige of petrol on the working surfaces, and be very moderate in applying the clock-oil. It is wanted only in the bearings: excess does no good and merely collects dust. Clock-makers sometimes dip the tip of a small screwdriver into the oil and just touch the parts concerned with it, as illustrated in Fig. 2.

A rough cleaning and re-oiling can be undertaken without dismantling the works themselves. Take the clock out of its case. First disengage the pendulum (being careful not to bend or damage the fine steel ribbon or suspension spring on which it hangs, or touch the screw regulator) and withdraw it, (Fig. 3). Next, unless the striking bells or gongs are part of the movement, remove the standard supporting them. This should leave the way clear for withdrawing the clock movement as a whole, probably after slacking off or

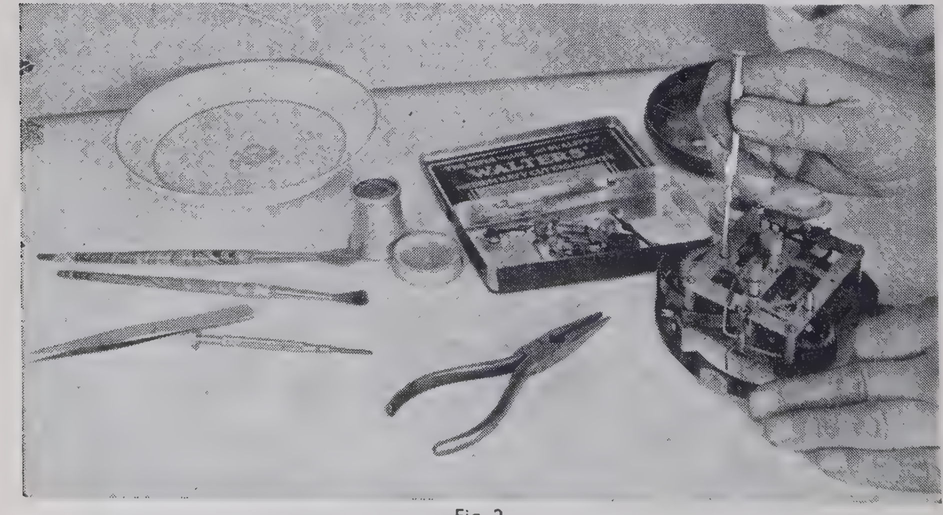


Fig. 2

removing a couple of screws. Most movements come away from the back. The retaining screws of one coming away from the front will probably be disclosed on opening the front glass.

When you have taken out the movement, set it down without resting it on any working part, especially the striking hammers, which can easily be bent.

Removing Dust.—Dust the case thoroughly inside and out. Dust will have collected in difficult places, inside the bezel or frame holding the glass. A camel-hair brush will dislodge it, but will not carry it away easily. A jet of compressed air from a motor-tyre pump will dispose of it.

A thin, pointed adapter nozzle about 5 in. long, screwed at one end to fit the thread of the pump and drilled at the other with an orifice about the size of a pin's head, would be useful for this and other purposes. It must be home-made or specially ordered. Slow strokes will produce a blast of surprising efficacy. Fig. 4 shows the operation.

Having brushed and blown, allow time to settle and wipe as clean as possible. Clean and polish the glass, inside and out, with warm soapy water.

Cleaning the Movement. — The greatest care must be taken not to bend any of the mechanism. Handle it only by the framework and be careful when you introduce cleaning implements into the works. The air jet, if directed to the bearings of the various spindles, will blow out some at least of the metal slime resulting from wear. This can be wiped away with clean pipe cleaners of the wire and wool variety. If there is old oil which has become sticky and hard, moisten the pipe cleaner with petrol. It can be bent up into any shape necessary to reach awkward corners. The illustration shown at Fig. 5. shows the cleaning process. If the air pump is not available, brush and pipe cleaner will between them accomplish a good deal. If the face is begrimed, it may be washed with a soft, clean, soapy rag and dried and polished, taking care to avoid the hands.

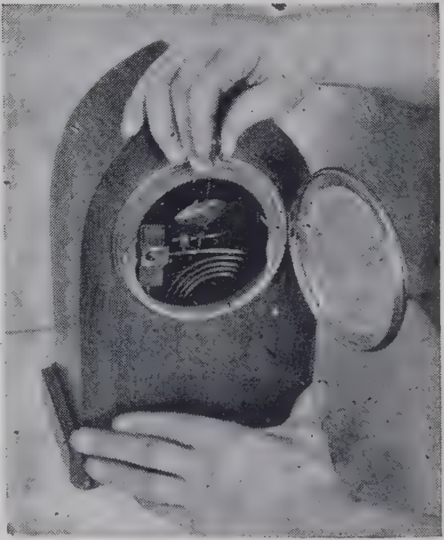


Fig. 3

Oil can be applied with the tip of a pliable wire such as a wire paper clip. Give special attention to the escapement wheel and to the second wheel which

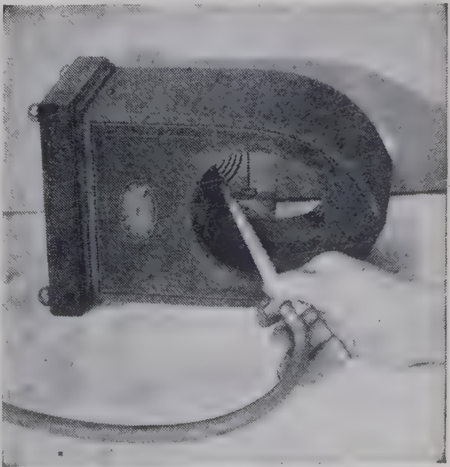


Fig. 4

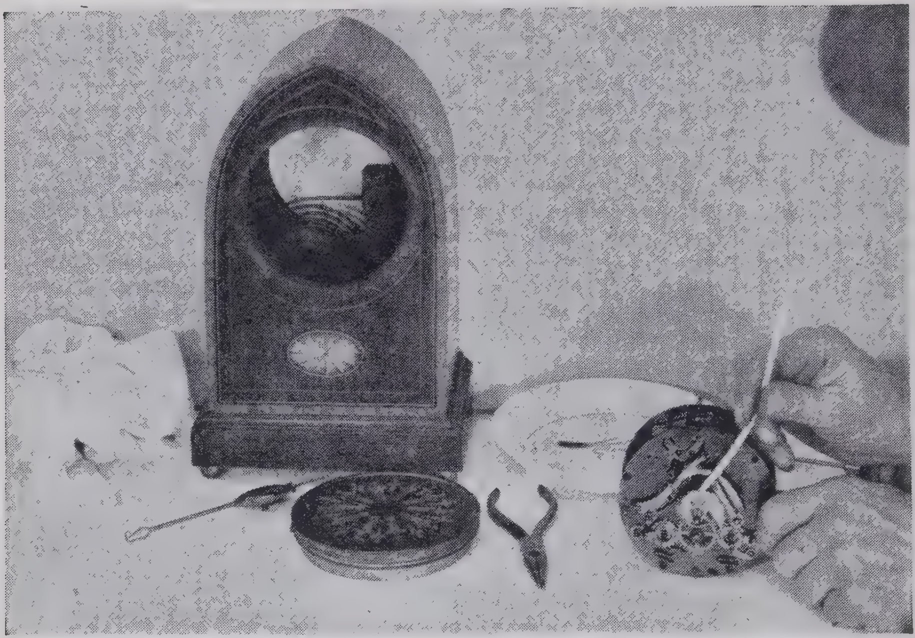


Fig. 5

carries the minute hand, as these do much of the work. Confine your oiling to the bearings. Oil on the pinions and cogs does more harm than good. Wipe away any excess.

If the clock is fitted with a balance wheel, as in Fig. 6, instead of a pendulum, lock-nuts are sometimes provided for taking up wear. You may have to fashion a small plate spanner to fit them out of stout sheet iron, making the hole with a drill and small square file. The adjustment is a case of trial and error. Do not screw up the bearings too tightly. Whatever you do, do not touch the hair-spring, and be careful not to get oil on it. Time keeping depends upon its shape and weight and interference is bound to impair it.

Striking Clocks.—In clocks with striking movements, Fig. 7, the spindles of the striking mechanism should have attention and also the pivots (often three) on which the striking rack and levers swing, together with the bearings of the striker arms. Sometimes the clamps or screw securing the bells wear loose owing to vibration so that they give a deadened buzzing note. If this is the case, tighten them up. A brightly polished bell emits a clearer tone than a dull one. Bells should, therefore, be polished; gongs are usually of blued-steel wire and require nothing more than dusting.

When the movement has been put back in the case, it is probable that, in the case of gongs, adjustment for position will be necessary. Adjustment is correct when the felt striker stands appreciably clear of its gong. If actually touching, the second will be damped in striking; if nearer still, the hammer may strike a series of diminishing blows instead of one clear one. The correct position is ultimately found after testing patiently until successful.

There is usually more than one way to make the adjustment. The spindle of the gong-standard is probably screwed at its lower end, and provided with a stop inside the base of the case, and a nut and washer outside. It is therefore simple to raise or lower it as a whole. Furthermore, the felt striker is usually attached to its lever by a set screw, allowing fine regulation. Cases may occur, however, where the lever itself (usually of brass wire) must be bent. This requires care and judgment. Be careful to support the lever during the process and never bend it against the unaided resistance of the mechanism.

Regulating.—Now start the clock going and see what sort of time it is keeping. In pendulum clocks the beat should be perfectly even; if it is not the movement should be slightly skewed in the case or any levelling set screws manipulated. As a last resort, the case itself may be packed with strips of cardboard or paper under the feet until the beat is even.

However careful you may have been, it is likely that the clock will require regulating anew. In pendulum clocks, time keeping depends on the length of the pendulum, which is shortened to accelerate. Two adjustments are commonly provided, a coarse one by a screw on or below the bob, and a fine one by a micrometer at the point of suspension of the pendulum, its spindle being brought through to the face of the clock, and operated by a small subsidiary key. In balance wheel clocks, in common with watches, the only adjustment is by means of an indicator lever, moving over a graduated scale, which regulates the length of the hairspring left free to oscillate.

A word on setting the clock to the correct time when starting it. In non-striking clocks, the minute-hand may be turned either way without risk. But, in striking clocks, it should never be turned backwards. Moreover, when turning it forward, make a pause just after each hour or part hour striking-point is reached, to allow the mechanism to complete striking. If the number struck does not tally with the hour shown, the hour-hand, which is merely a friction fit, may be moved to correct the error

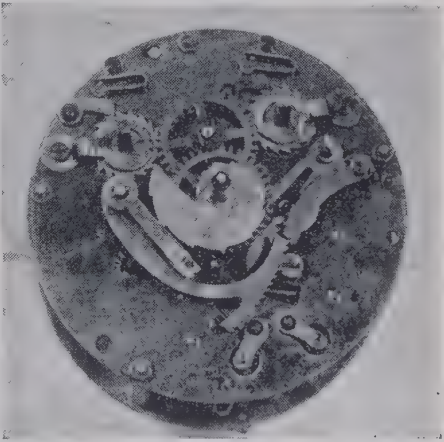


Fig. 6

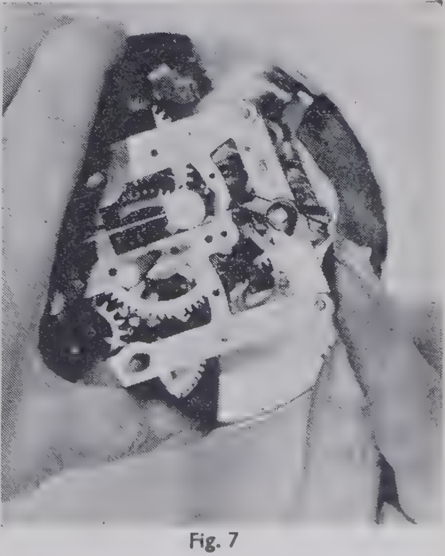


Fig. 7

Some standard time keeper is necessary. Wireless time signals afford an efficient check on the fast or slow running of the piece under observation. Make a comparison every twenty-four hours and touch the regulator accordingly. It is a tedious process sometimes extending over weeks and one calling for great delicacy of touch near to correct time keeping.

Repairs are Risky.—There is little the amateur can do in the way of repairs to clocks, and nothing to watches. Spring breakages are chiefly concerned and to do anything with springs involves drilling, filing, annealing and retempering, processes requiring special appliances and great experience.

In weight-driven clocks, gut is sometimes used to support the weight and it should not be beyond the amateur's capacity to effect replacement.

Electric clocks are increasing in vogue. These require oil like others. But they call for greater care in its application as the wiring is very fine and easily broken. Those depending on a battery will require new cells from time to time, a simple replacement. Those working on the telechron system, off alternating current mains, are infallible time-keepers and give very little trouble.

Watches are best left alone. Even to oil them is impossible for most amateurs. The fact of their stopping is proof that they need attention. Take the watch to the watchmaker as soon as possible.

MECHANICAL DOOR BELL

THERE are two common types of mechanical bells. That shown at A in Fig. 1 is operated by a bell push like an electric bell. When the button is pushed it releases a spring driven hammer and continues to ring as long as the push is pressed or until the spring has run down. From this it will be observed that it is essential to keep the spring wound up as in a clock. This is effected by turning the dome in a clockwise direction. A bell of this type gives a very clear ringing tone.

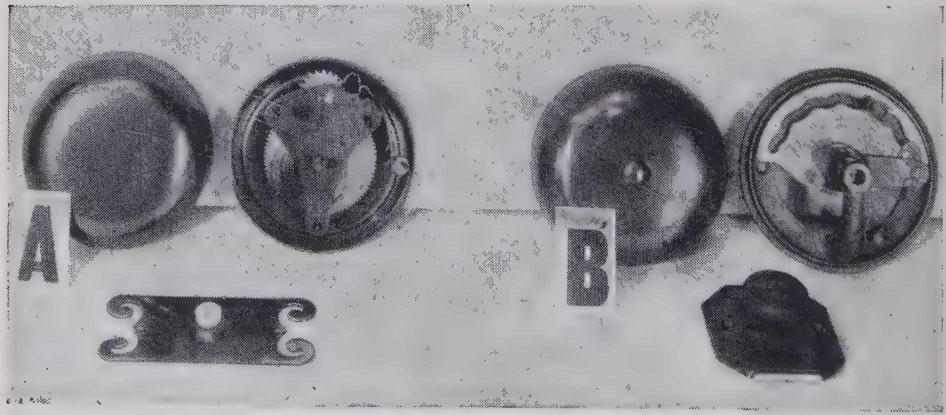


Fig. 1

The other type is illustrated at B in Fig. 1. The hammer of this bell is operated by turning a knob, and as it is not fitted with a main spring, does not need to be wound up. Such a bell is slightly cheaper than the spring-driven type.

Both bells are fitted to the door in practically the same manner, the only difference being in the fixing of the controls.

To fit the push-operated spring-driven bell, proceed in the following manner: First mark the desired position of the push. The latter is usually mounted at a convenient height in the centre of the mounting of the door or on the centre rail.

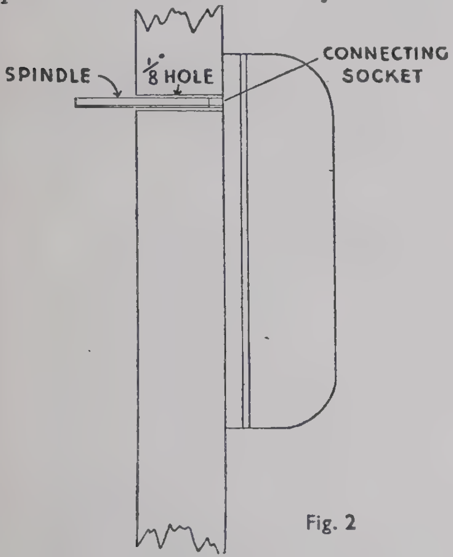


Fig. 2

Having marked the centre position of the push button, examine the other side of the door to see that there is nothing to obstruct the fitting of the bell, because the centre of the bell does not come in line with the centre of the bell push. The spindle socket which accommodates the end of the spindle and connects the press to the bell is situated near the rim of the frame that supports the gong, as indicated in Fig. 2.

At the marked point bore a hole $\frac{1}{8}$ in. in diameter through the door, using a sharp twist-bit for the purpose, taking care to see that the hole is square with the flat surface of the door. Remove the dome and insert the end of the wire firmly into the connecting bush at the back of the bell, push the spindle through the hole and fix the bell with $\frac{1}{2}$ in. brass screws. Next cut off the projecting end of the wire $\frac{3}{4}$ in. full from the face of the woodwork, place the button on the end of the wire and press the button case into place.

If the bell rings when placed in position it follows that the spindle is too long, so a small piece can be cut off with the aid of a pair of cutting pliers or a file. When this adjustment has been made, fix the button plate with small round-headed screws. These are generally provided with the bell.

In replacing the dome make sure that the spring is fully wound or damage may be done to the mechanism.

Rotary Knob Type.—Much the same procedure is followed when fitting a bell of this type. Here the spindle connecting the knob to the bell is in line with the centre of the bell and is rectangular in section. To obtain sufficient clearance for the spindle, bore the hole with a $\frac{5}{16}$ in. twist-bit. Having bored the wood, fit the shank and fix the bell, make adjustments to the spindle and fix the knob.

Bells of this description do not require cleaning as they are generally bronze finished. An occasional drop or two of oil is all that is necessary to keep them in serviceable condition.

REPAIRING CHINA

When a mishap occurs to a china article of sentimental value—be it ornament, crockery or other similar object—an attempt should be made to repair it, unless the article in question is so shattered that it is rendered useless.

There are numerous proprietary adhesives which can be had for repairing broken china. Some of these have to be melted before use. Such cement should not be employed for repairing articles that have to withstand heat. In using this kind of adhesive the parts to be joined should be warmed, otherwise it will be chilled before it has had time to stick properly, and the resulting joint will be weak.

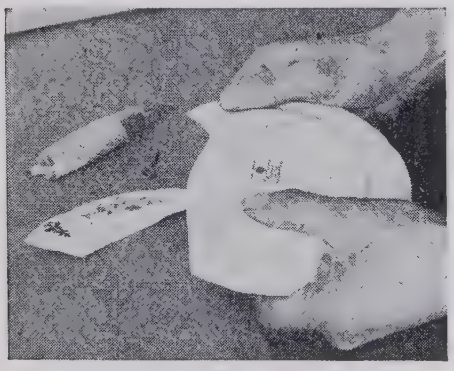


Fig. 1

Liquid glue is also suitable for joining china that does not have to withstand heat.

Remember, when applying any kind of adhesive—and this applies equally when joining wooden articles—to use as little as possible. It is a mistake to think that the greater the amount of fixing medium used, the stronger the joint will be. Cement too thickly applied also causes an ugly and obtrusive joint. The parts to be joined must always be perfectly clean and free from every trace of grease.

When making the repair a thin film of adhesive should be applied to both edges of the broken parts and the latter pressed firmly together as illustrated in Fig. 1. In many cases it will be found an advantage to bind the parts securely with electrician's adhesive tape. Do not use the repaired article for at least a week, in order to allow the cement to set.

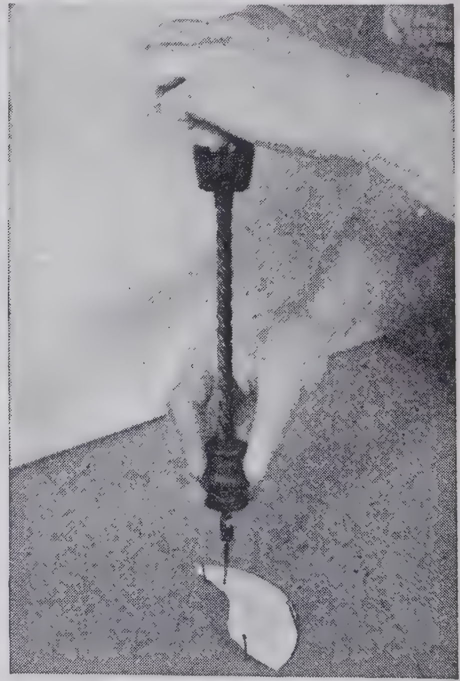


Fig. 2

A simple and effective home-made adhesive for joining china is made by mixing some plaster-of-paris to a paste with the white of an egg. This preparation should not be made up until it is actually required, as it sets and becomes hard very quickly.

Good results can also be obtained from white lead and linseed oil. In preparing this it is essential that the white lead be ground very fine, free from small lumps and mixed with the oil to form a stiff paste.

Riveting.—To repair a plate or other article that has to withstand heat and be extremely strong it is best to rivet the parts together. The chief requirements are a suitable drill, properly applied, and one or two sundry tools such as pliers, light hammer, etc.

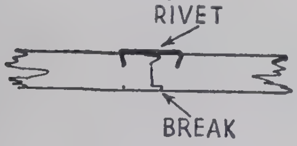


Fig. 3

A special drill having a diamond point is used by professional china riveters, but as such a tool is not likely to be in the possession of an amateur, an ordinary hard steel V-pointed drill, driven by an archemedian drill-stock as shown in Fig. 2 will suffice, provided that any hard glaze is first removed. This can be effected by a glass-cutter.

The rivets generally used for china repairs are made of tinned brass wire, $\frac{1}{16}$ in. thick and the holes to receive them should be a trifle larger—say $\frac{3}{32}$ in. Therefore it is advisable that a drill bit of this size should be used.

It is best to make the holes $\frac{1}{4}$ in. from the edge of the break and slant them slightly inwards as shown in Fig. 3, as the springiness of the rivets draws the parts closely together. The holes should be drilled to a depth of not more than $\frac{2}{3}$ in. of the thickness of the parts to be joined, and when boring the holes, lubricate the drill with turpentine.

The length of the rivets should be about $\frac{5}{8}$ to $\frac{3}{4}$ in. and the ends bent to coincide with the sloping holes in the work.

To make a rivet, hold the wire between the jaws of flat nosed pliers and gently tap the ends with a light hammer. Then bend the ends of the wire slightly inwards and flatten the middle portion by placing it on a piece of hard metal and tapping the rivet gently with a hammer. The flat surface so made allows the rivet to lie close to the surface of the china. The rivet is then sprung into the hole and tapped home by striking it very lightly with a hammer.

Three rivets are generally necessary to join each separate part of the broken china.

Plasticine or putty can be used to advantage for supporting broken parts while springing the rivet in place. To finish, fill up the hole with liquid plaster-of-paris.

MAKING USE OF ODDS AND ENDS

It is astonishing what can be done with many odds and ends that usually end in the dustbin. For instance, rectangular cigarette and tobacco tins serve for the storage of screws, nails, drills and many other small articles, especially if grouped in a cabinet.

Cigarette Tins.—Fig. 1 shows a simple cabinet for such tins. It consists of a top and base of yellow deal, $\frac{3}{8}$ in. thick, with sides, back and upright divisions of $\frac{3}{16}$ in. plywood. The top and base are purposely made thicker so that the remaining parts can be attached with screws, which, in this case, are better than nails. It is advisable to house the ends of the vertical divisions into the inner faces of the top and base.

To facilitate withdrawal of the tins, fix a small handle on each. This can be done by drilling the fronts and fitting ½ in. No. 4 B.A. brass bolts and nuts, or small template strips could be soldered to the fronts. Soldering, however, necessitates the removal of the lacquer or paint on the tins.

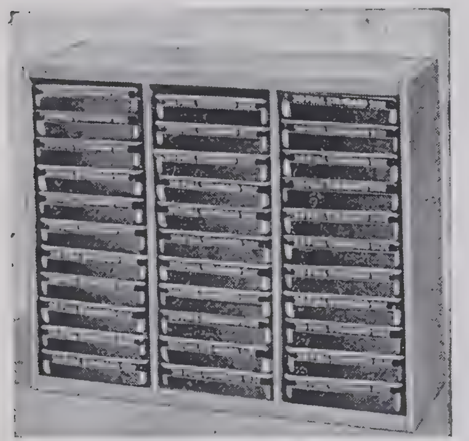


Fig. 1

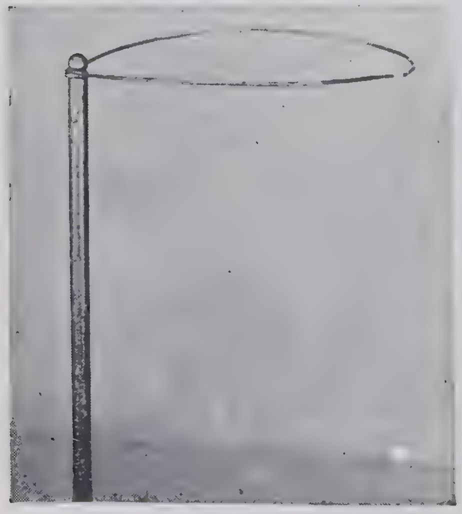


Fig. 2

Each tin should be carefully painted. Cellulose lacquer is advisable for this purpose. The time expended will be repaid in prevention of rust.

Syrup Tins.—Empty syrup tins with lever lids make excellent containers for paint. A handle can easily be added by boring holes in the side and bending a piece of thick galvanised iron wire to the desired shape.

Round brass stair rods are useful as supports for plants, especially if a piece of thin wire is fixed round the top to hold the plant in position, as in Fig. 2. They will last indefinitely if given an annual coat of paint, preferably of green.

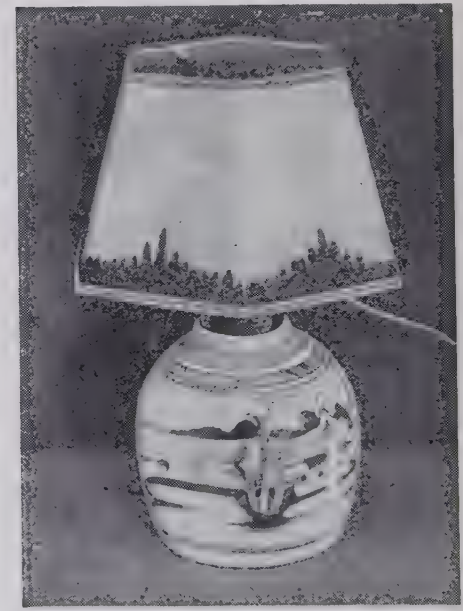


Fig. 3

Bottle Vases.—Wide-mouthed glass bottles of artistic shape can be made into excellent flower vases. Cellulose lacquer can be used to colour them to suit any room.

An electric table-lamp as illustrated in Fig. 3 can be made with a preserved ginger jar for the body. Shape a piece of wood about 1 in. thick to fit tightly into the mouth and, on this wood, mount a key-switch electric lampholder of the shade-ring standard bayonet-fitting type. Connect a length of insulated twin flex to the lampholder. Partially fill the jar with sand and fit the top in position. The sand weights the jar and prevents it from falling over when a shade is fitted. A piece of baize or felt should be glued to the bottom of the jar to prevent it scratching the table.

Cotton Reels.—A serviceable woodworker's marking gauge can be made from a cotton reel by inserting a length of circular hardwood in the centre hole. A small hole should be drilled near the business end of the spindle through which the pointed end of a headless wire nail is forced to form the marker. The spindle should be sufficiently tight in the hole to keep it from slipping when in use.

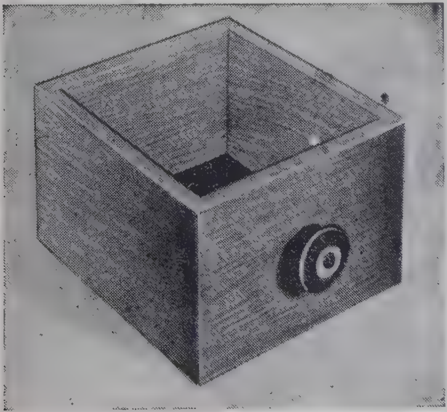


Fig. 4

Cotton reels are also useful for making drawer handles and cupboard knobs. One flange is sawn off and the remainder painted or stained to match the drawer. The handle is fixed to the drawer with a wood screw and washer, as indicated in Fig. 4.

Buttons can be made from cotton reels by cutting them into sections of the desired thickness and shape, drilling holes to take the thread, rounding the edges with glass-paper and painting them with cellulose lacquer.

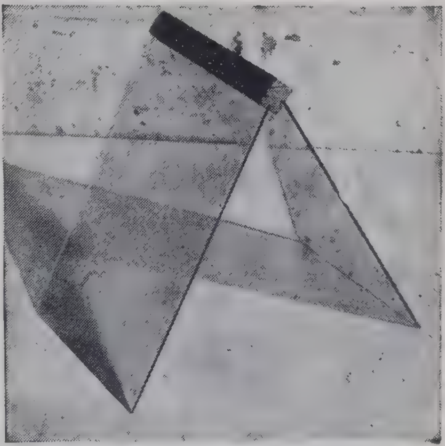


Fig. 5

Old photographic plates, especially those of half-plate size and over, can be used as plant propagators, as in Fig. 5. The film is removed by soaking the plates in hot water. Groove two adjacent faces of a piece of wood of square section to take the top edges of the glass. Another use for photographic plates is the making of picture frames with a passe-partout binding.

Fig. 6

Newspapers.—These are handy for stopping up cracks between floor-boards, and spread evenly on the floor, they make an excellent underlay for a carpet or linoleum. In laying linoleum over a concrete floor never omit a thick underlay of newspapers.

Besides providing patches for puncture repairs, old inner tubes can be used for making rubber bands. Simply cut across the tube with a pair of sharp scissors, which should be dipped in water. Suitable lengths of inner tube also make effective grips for such things as cricket bats and canoe paddles. A strip cut from an old outer cover and tacked round a broom-head prevents damage to furniture and paint on the skirting boards.

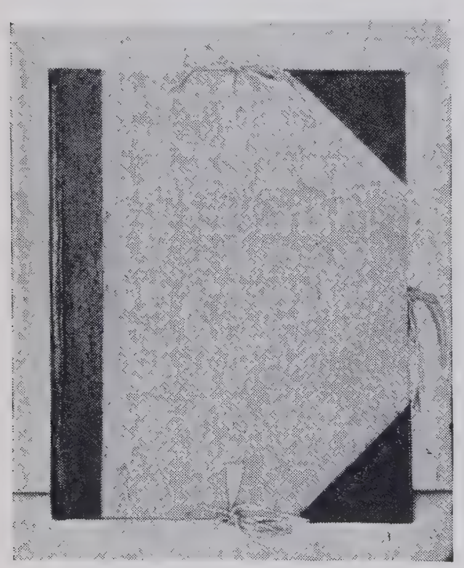


Fig. 7

Vulcanite knobs from disused wireless sets make heat-proof knobs for kettle lids, as illustrated in Fig. 6.

Sheets of strawboard can be made into loose covers for holding drawings, maps, and music. The boards should be covered with stout brown paper or leather paper as used by book-binders. Holes punched near the edges through which tape is threaded provide a simple fastening, as shown in Fig. 7.

Old lino may be used to cover dog kennels and rabbit hutches, while small pieces can be used as packing under the legs of unsteady furniture.

Pieces of Carpet.—Portions of an old carpet can be used for making small mats. These are useful in such places as the scullery and workshop where the floor may chill the feet. Cut out pieces to the desired size and bind the edges with strong carpet binding which can be obtained in a variety of colours to suit different carpet designs.

Pitch taken from worn-out high tension batteries is useful. When melted, it can be applied to the ends of wooden posts that have to be buried in the ground. Pitch is also handy for repairing felt roofing material on sheds and poultry houses.

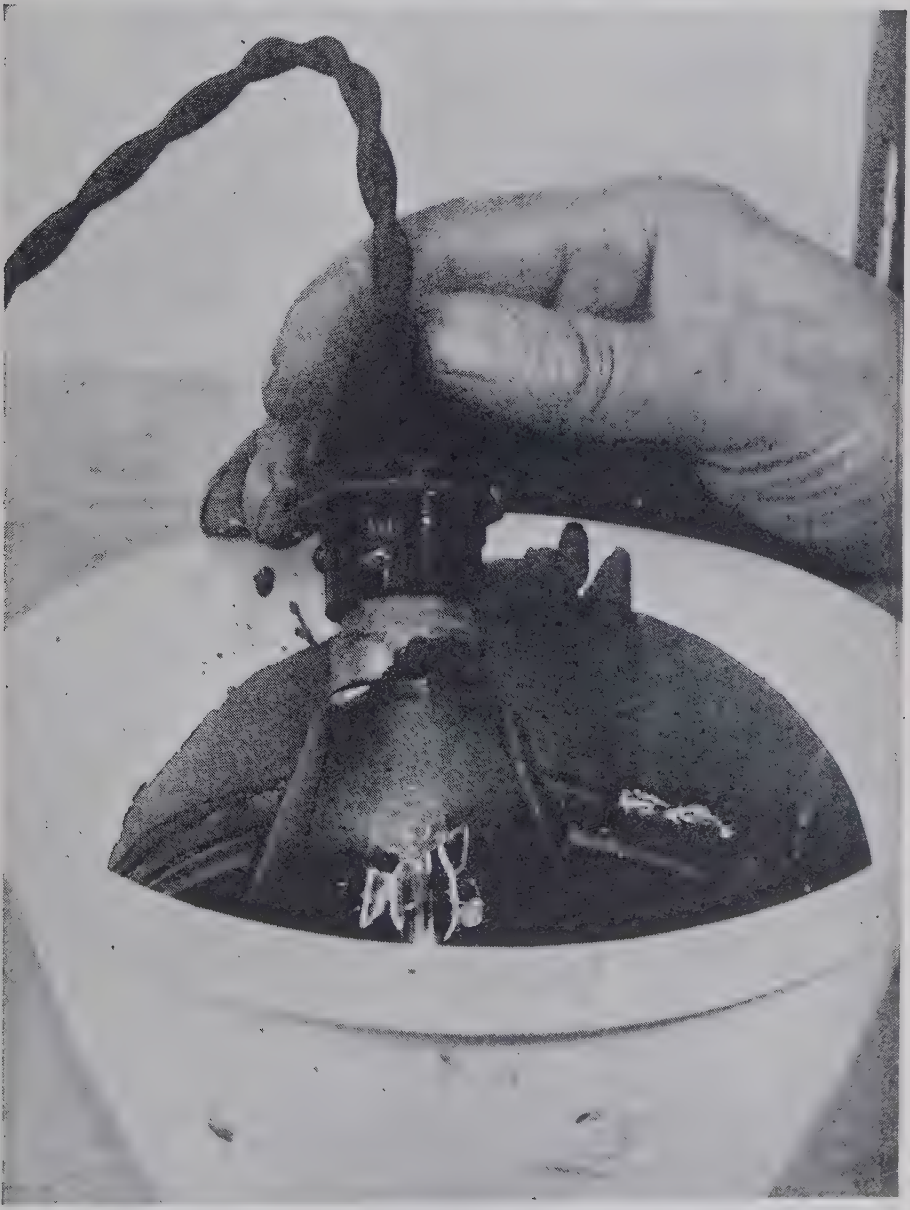
Campers will find that metal meat skewers are useful for pegging small tents.

Seasoned Wood.—It is often possible to obtain well seasoned and expensive hardwoods in the shape of old furniture by paying a visit to a jumble sale. Solid mahogany tables may sometimes be picked up at a price which compares favourably with the cost of new wood.

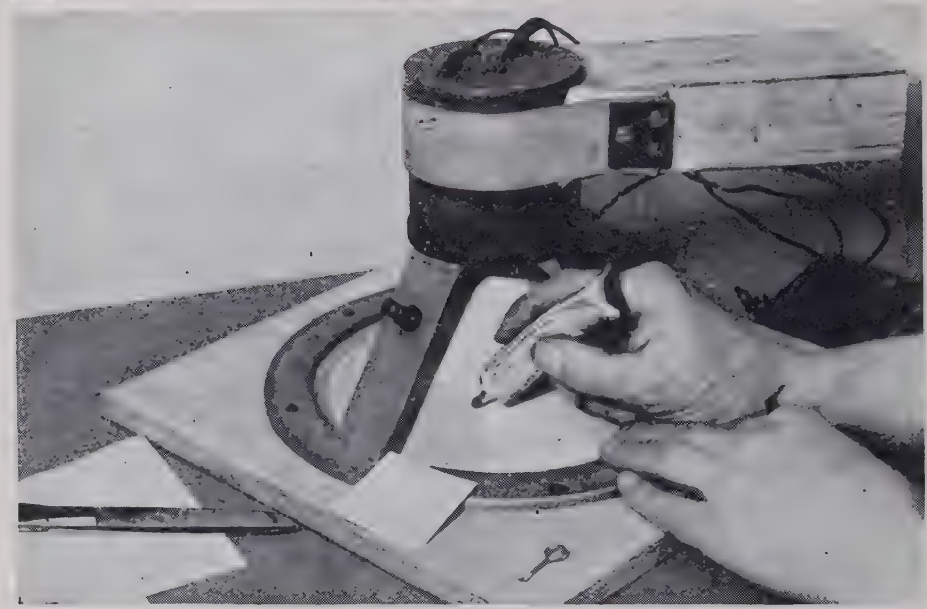
Venetian blinds provide the woodworker with strips of pine. The paint is easily removed with a chemical paint remover. A razor blade fitted to a wooden handle is excellent for cutting rubber, cardboard, leather and paper, and mounted on a wooden stand makes a good string cutter.

Electricians can use pieces of gramophone records for insulating, while complete discs can be employed for the plates of a Wimshurst's machine for experiments with static electricity.

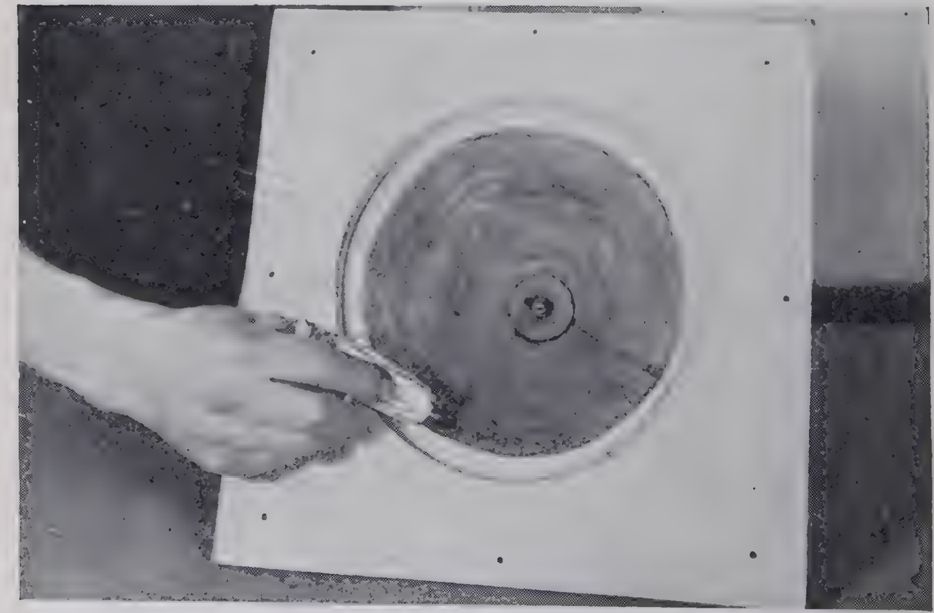
HOUSEHOLD HINTS FOR THE HANDYMAN



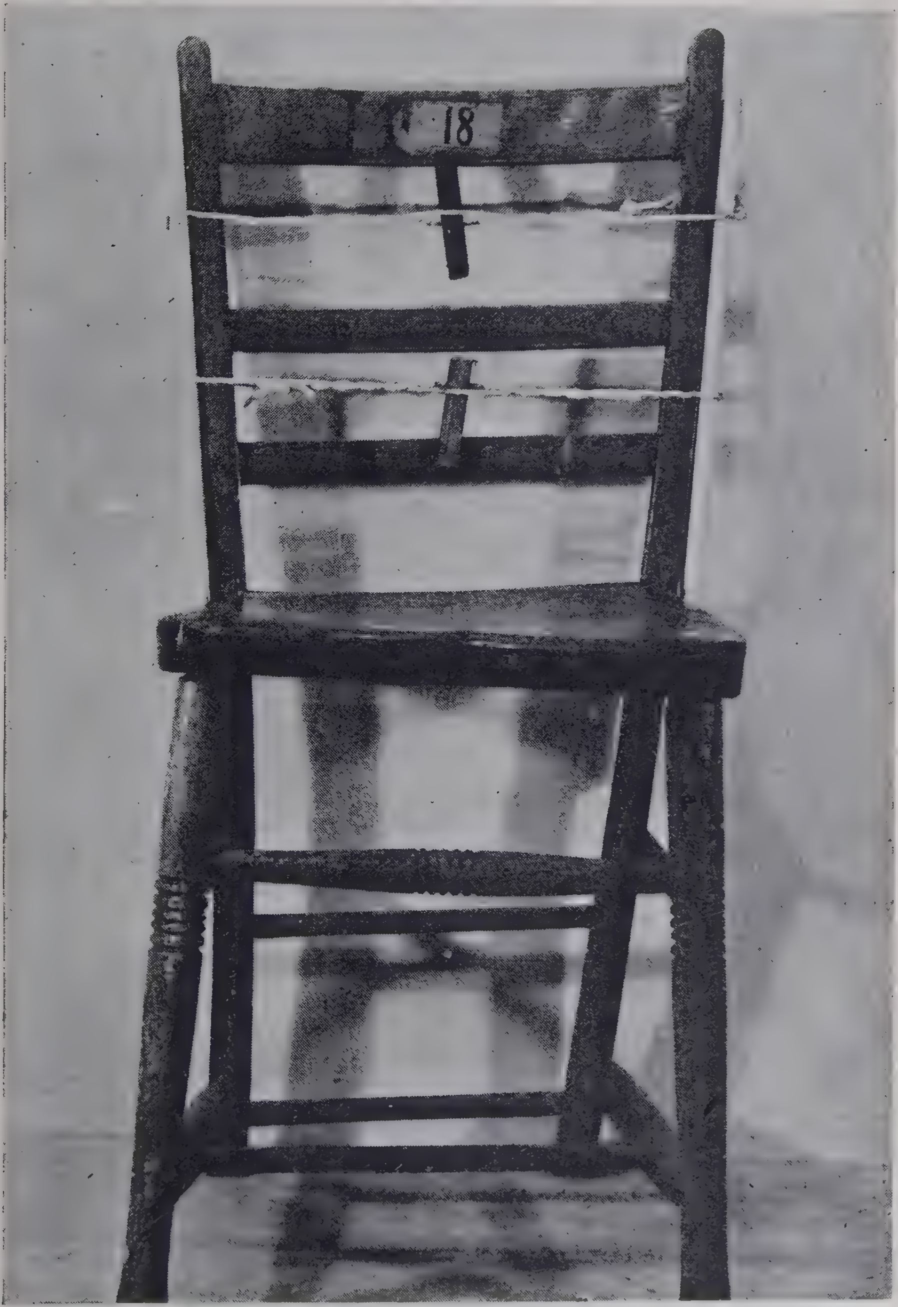
If you want to colour an electric lamp bulb, switch on the current and immerse the lamp in a bowl of lacquer as illustrated. Withdraw the bulb from the lacquer, shake it gently to remove the surplus and allow it to dry while the current is still flowing and the bulb is warm.



The two photographs on this page illustrate an excellent but quite simple method of repairing a damaged loud-speaker cone. You should first stick a patch of thick cartridge paper over the defective part of the loud-speaker, as shown in the photograph above.

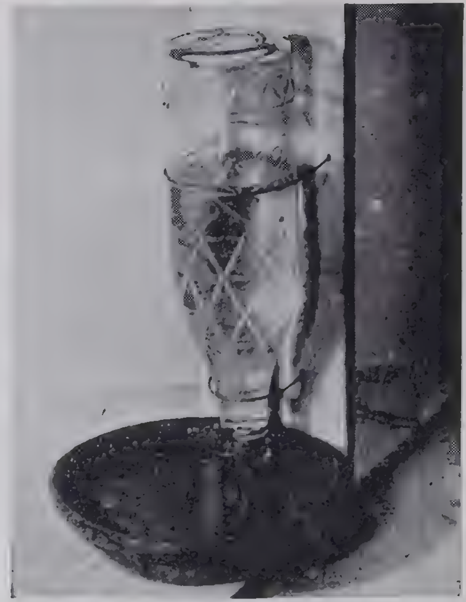


Then, as illustrated in the photograph above, a thin film of adhesive should be applied to the edges of the break at the front. Do not omit the second operation, otherwise an objectionable buzzing noise may be caused by the vibrations of the loose edges of the tear.

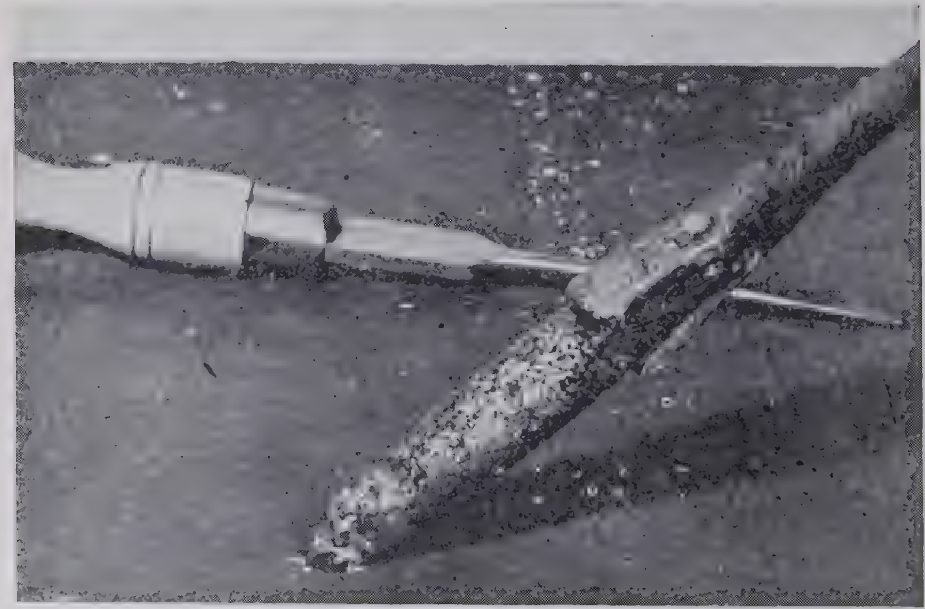


The back rails of the chair shown in this photograph have just been re-glued, and the picture shows a simple method of cramping the parts. Note the pieces of waste wood at the sides. These pieces of wood prevent the cords bruising the edges of the chair, causing marks that are almost impossible to remove.

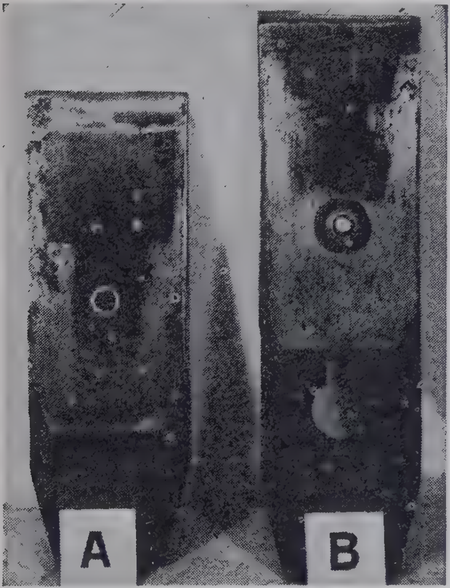
An exhausted dry cell can sometimes be given a new life by pouring in a little saturated solution of sal-ammoniac through a hole in the bottom, using a paper funnel as shown.



A well-known device for supplying a hen's drinking vessel. Suspend an inverted bottle filled with fresh water so that its neck is below the surface of the water in the dish.



It sometimes happens that a screw will prove obstinate and refuse to yield to ordinary treatment with a screwdriver. In such a case, apply a hot soldering bit to the head of the screw, as shown in the illustration above, and very often the screw can then be easily withdrawn.



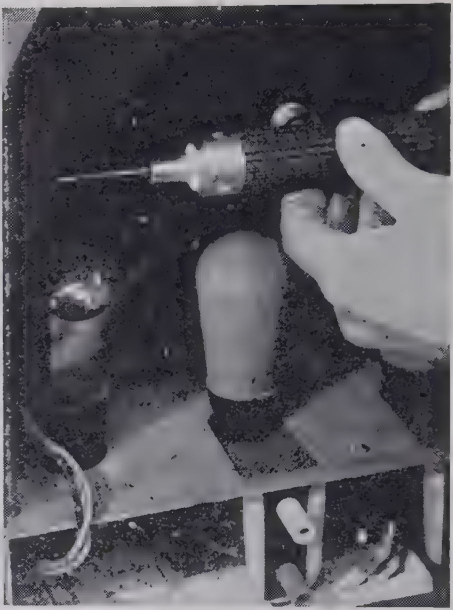
When planing always set the back-iron close to the cutting-edge of the cutting-iron (see A), for finishing work, and further away (see B) for roughing out.

Here is a neat method of hiding a nail-head. With a sharp chisel lift a small section of wood, drive in the nail with the aid of a punch, and glue the wood back into position.

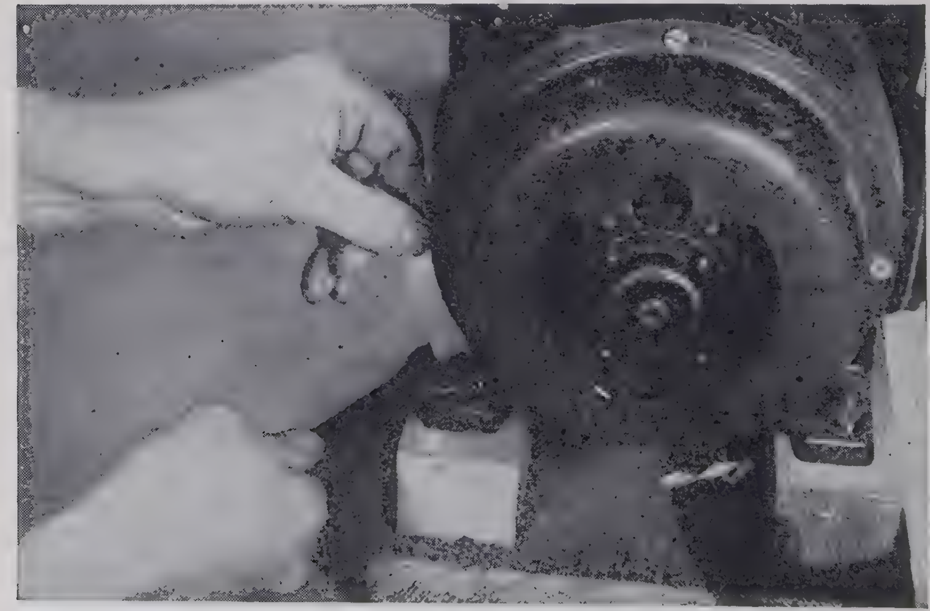
6D. PERFORATED ZINC 6D.

Perforated zinc is a very useful material for covering meat safes, etc. But as it is sold in rolls, it is not easy to work with until it has been flattened out. This can be done with an ordinary heated domestic iron as shown in the photograph just as though it were heavy cloth

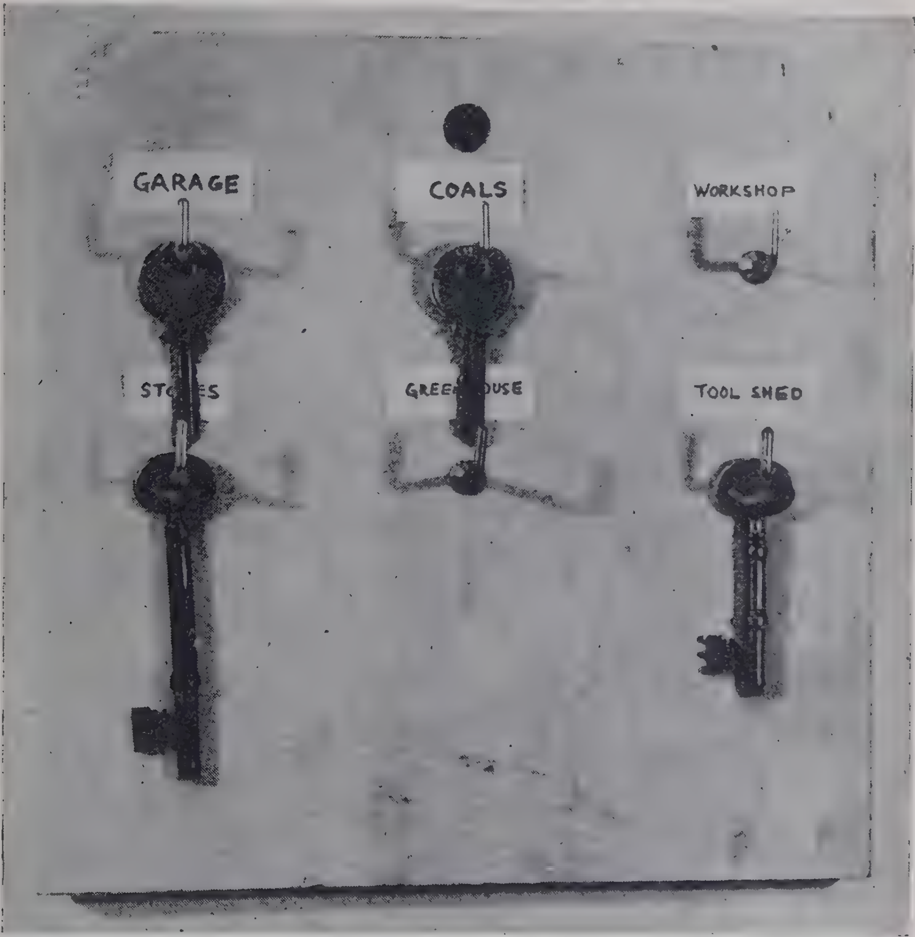
If you fear that a crack in the wall is widening, stick a piece of paper over it as shown. If the fissure widens it will break the paper.



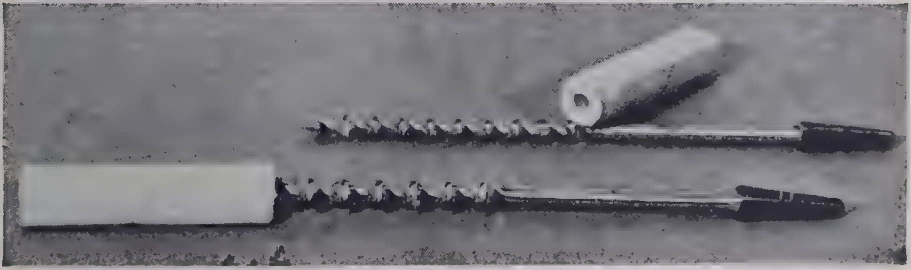
The handle of the screwdriver illustrated here contains a lamp, bulb and battery which projects a light through holes at the base of the blade.



The jaws of a spanner should fit the nut accurately and exactly. In cases where the distance between the jaws does not permit of this, insert a piece of metal of the proper thickness as shown, and tighten or slacken the nut in the usual way.

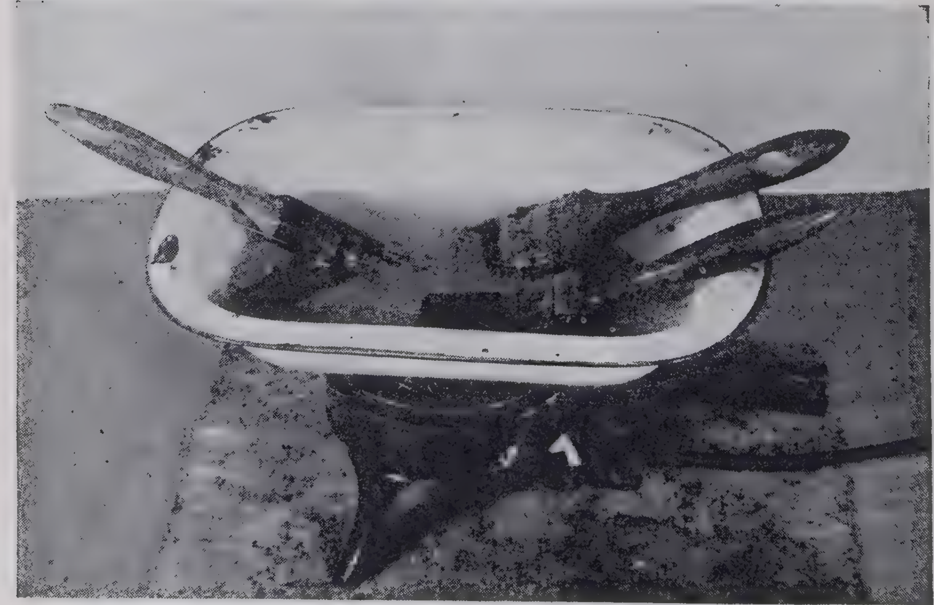


Searching for keys is merely a waste of time. With a piece of ⅜ in. thick plywood, a few dresser hooks, and some pieces of gummed paper, the handy key-board which is illustrated here can be made in a few minutes. It will be found to be well worth the small effort involved.

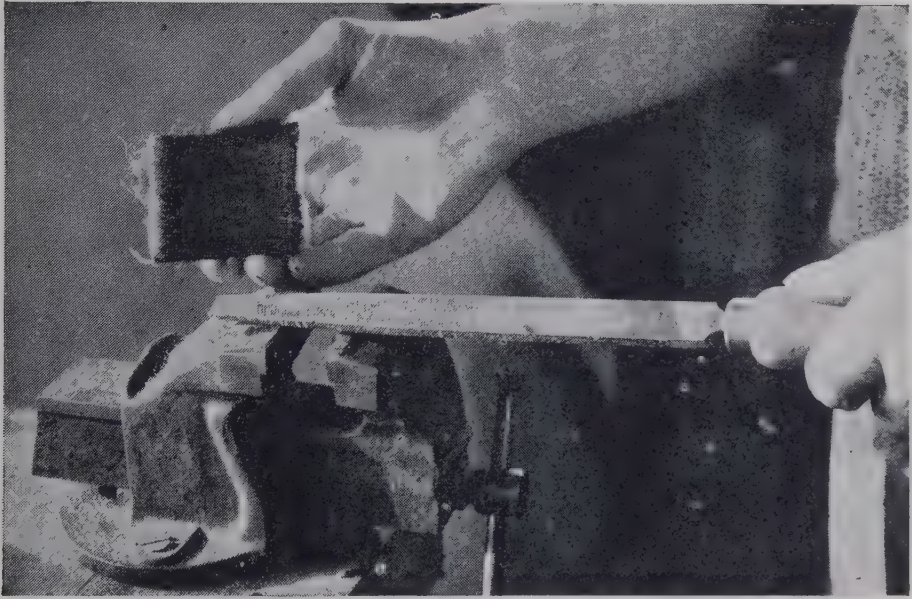


Twist-bits are not easy to re-sharpen and therefore their cutting edges should not be allowed to be blunted by coming into contact with other metal tools. It is only a matter of a few minutes to make sheaths of soft wood such as those illustrated here.

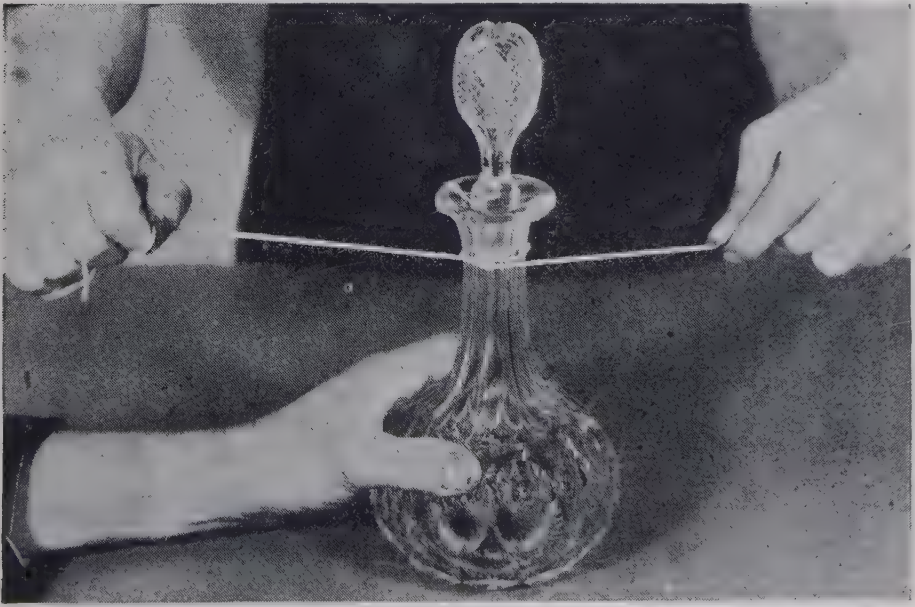
It is a very good plan to rub chalk on a second-cut and on the smoothing file as is shown in the photograph above. This greatly reduces the tendency of the metal to stick between the teeth, and as a lubricant, in addition. The chalk should be rubbed well in between the serrations.



If you have paint brushes which are hard with paint, this is a useful method for cleaning them. First put them into boiling vinegar as shown here, then rinse them in water; clean them next with turpentine, and then with soap and warm water before giving them a final rinse in cold.

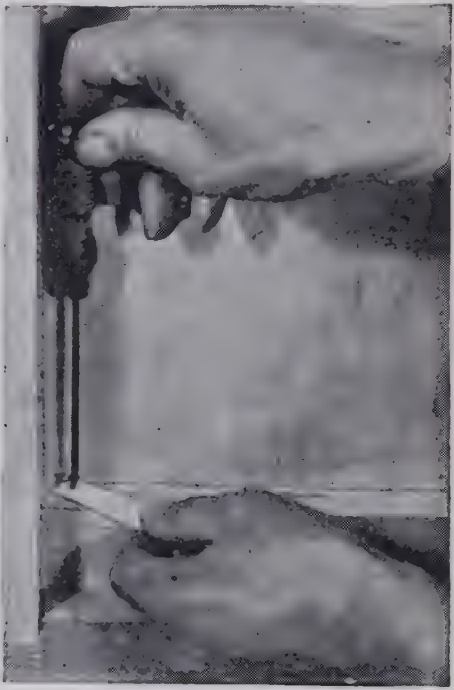


Here is another hint for those who cherish their files. A piece of file-card should find a home in every workshop, and should be used regularly as shown here. It is rubbed over the surface and is invaluable for keeping the files in good condition.

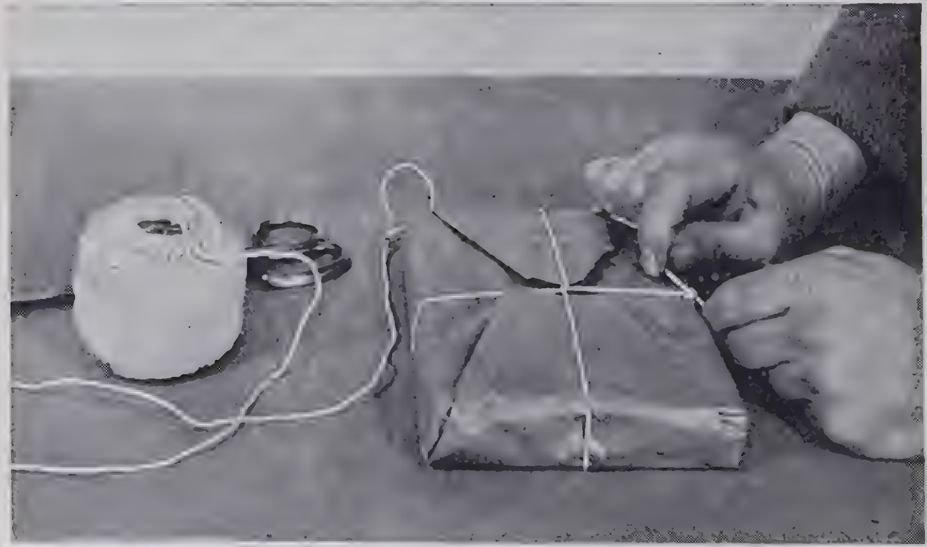


This photograph shows a simple method of withdrawing a glass stopper which has become obstinate. Wind a cord round the neck of the article and draw the cord rapidly to and fro. The heat generated expands the glass and lessens the grip on the stopper.

Always keep the tiny nipple of a blow-lamp free from obstruction. You should use the pricker every time you use the lamp.

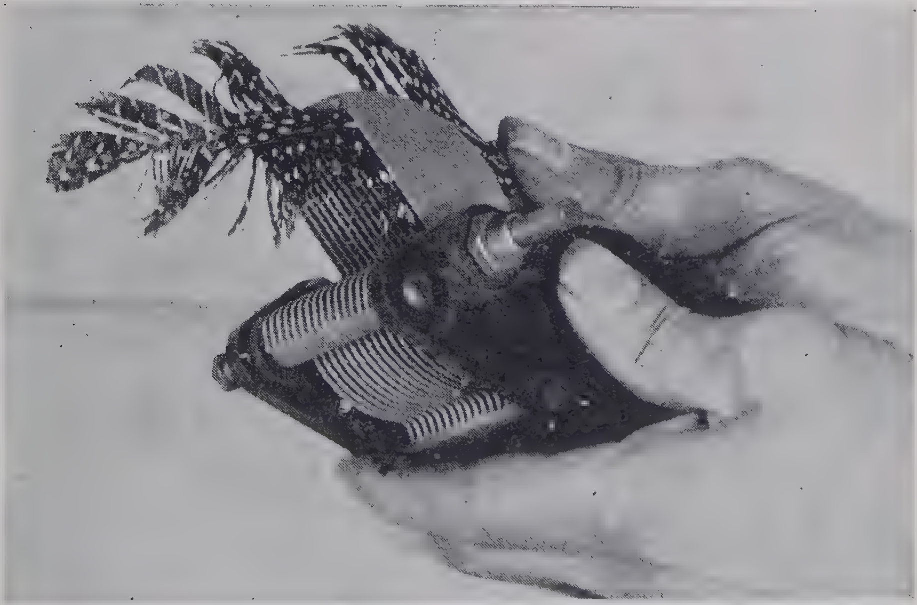


If you have difficulty in starting a small screw insert the end in a slip of paper and use it as a holder as illustrated here.



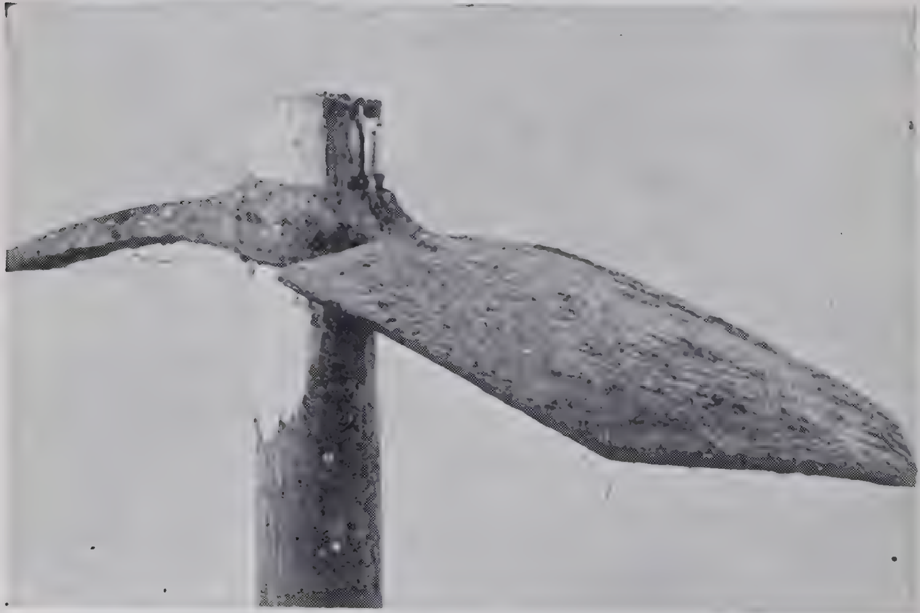
Balls of string are liable to unwind themselves and consequently the string gets knotted and has to be wasted. This difficulty will not arise if you withdraw the string from the centre of the ball as illustrated, retaining the other end in its original coils on the outside.

If a bad workman blames his tools, a good workman will look after them. It is a good thing to make a point of cleaning your oilstone with a piece of rag every time you have finished using it. This takes only a few seconds and prevents the formation of clots of stale oil and dust.

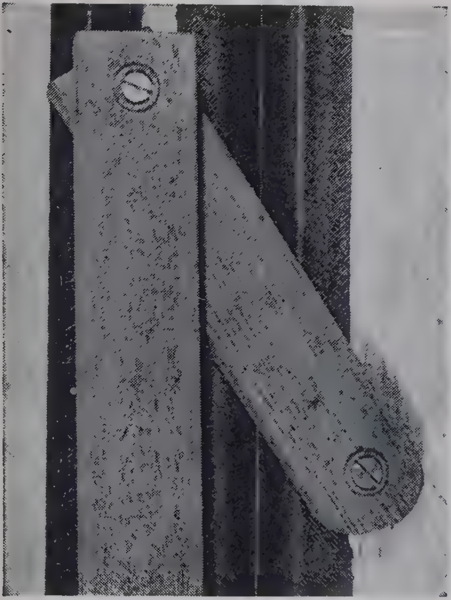


Dust between the plates of a radio tuning condenser very often causes crackles in the loud speaker. The best way to get rid of the dust is to push a feather between the plates as shown here. A turkey feather is best because it is larger, but it must be clean and dry.

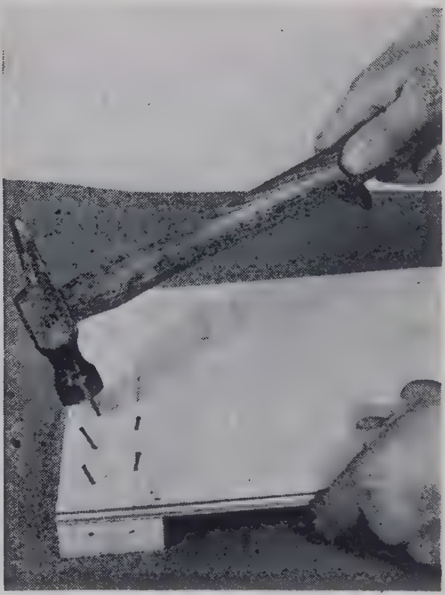
A useful sink-basket can easily be improvised out of a biscuit tin or other rectangular metal box, by punching a series of holes at intervals all over the bottom. Remember to make the holes from the interior so that the rough edges project downwards.



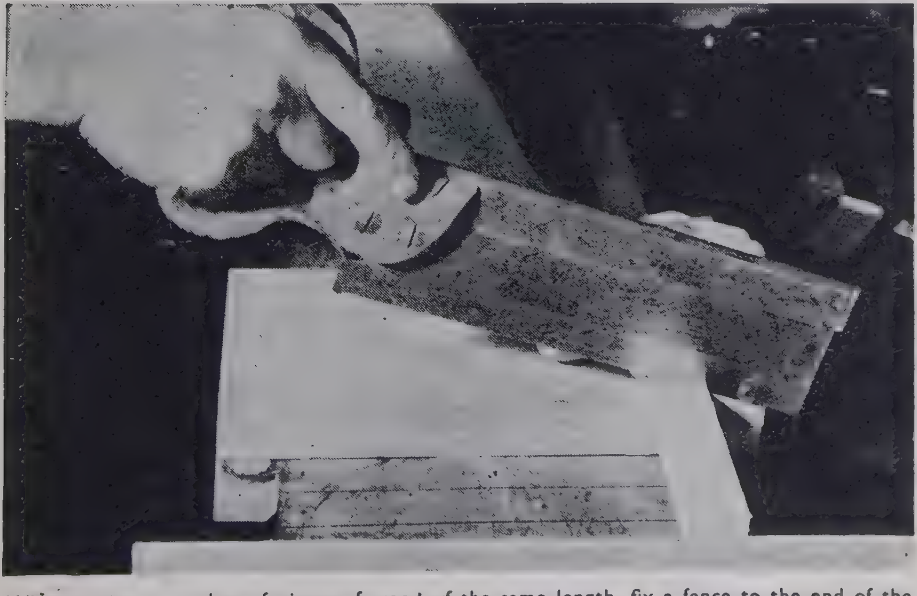
When you are fitting new shafts to gardening tools such as the one shown here, always leave a short projection at the end, and drive in the wedge. The inlaid wood will cause the shaft to splay out above the head and prevent the tool head from slipping off.



Remember to use metal washers beneath the heads of screws as well as between the surfaces of moving joints. Lubricate with graphite.

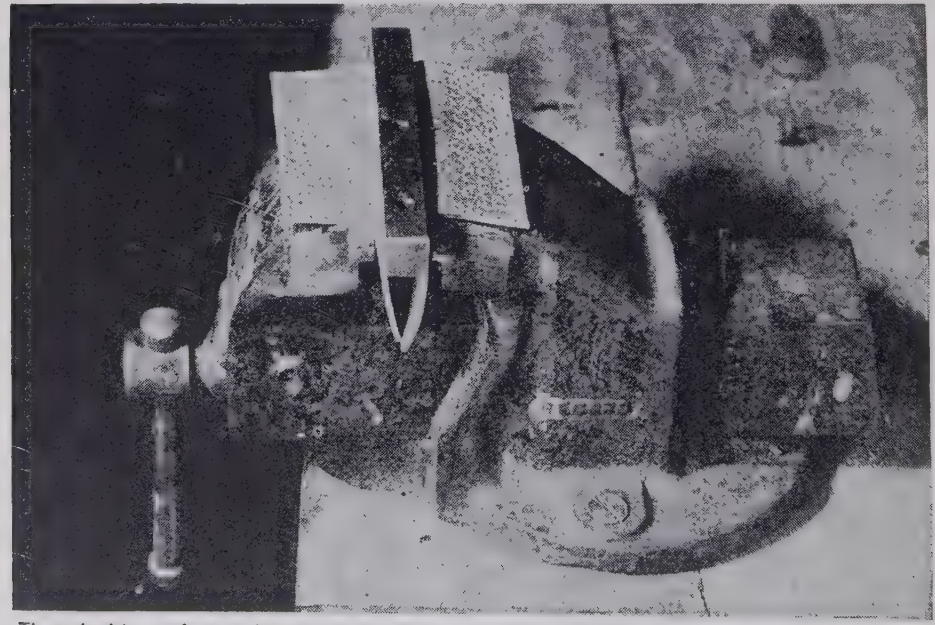


When nailing a butt-joint, greater strength is obtained by slanting the nails to form dovetails than by hammering them in vertically.

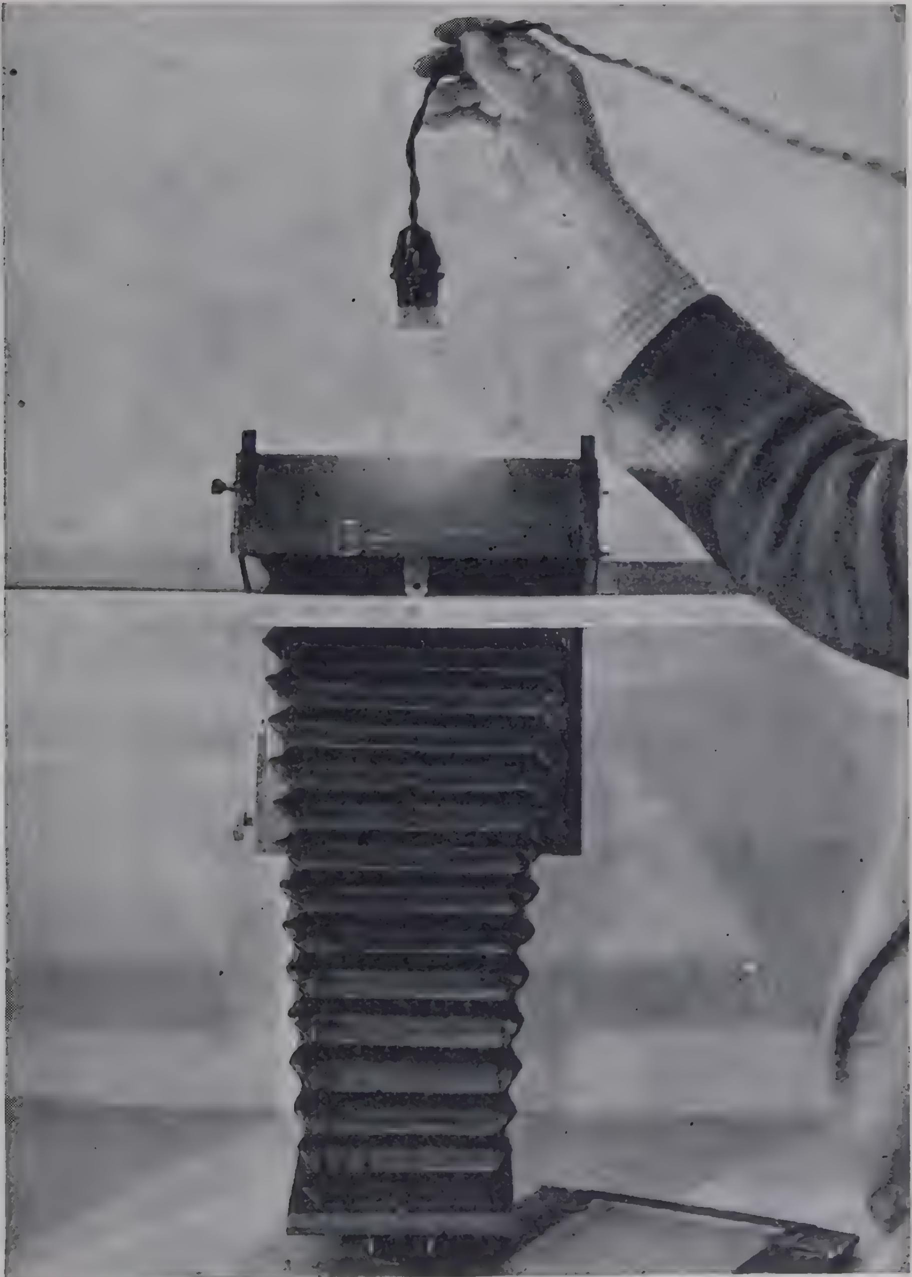


When sawing a number of pieces of wood of the same length, fix a fence to the end of the bench to act as a stop, and mark guide-lines on the bench top to correspond with the working edge of the bench hook, as shown. This will save a great deal of time and trouble.

To clean the interior of an old, encrusted bottle, half fill with warm water and add a small quantity of sand or crushed cinders. Shake vigorously. A little vinegar added to the water is useful for removing chalky deposits. The mixture should be fairly strong and nearly boiling.



The naked jaws of a metal vice should never be permitted to come in contact with the surfaces of an important piece of work, as they will cause permanent scratches on the surface and may damage the edges. If a metal clamp is not available use shields made of pieces of old linoleum.



Above is shown an infallible test whether the bellows of a camera is light-proof. Attach an electric light bulb to a length of flex and lower the light into the extended bellows of the camera. Scrutinise carefully for pin-holes. The appearance of any particle of light inside will make these instantly visible.

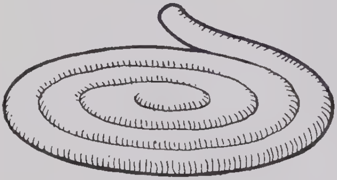


Fig. 1

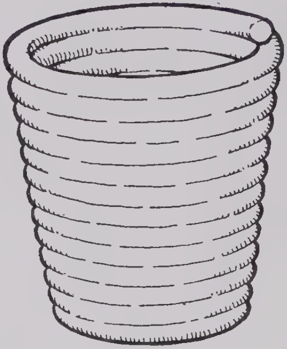


Fig. 2

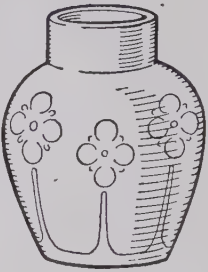


Fig. 8

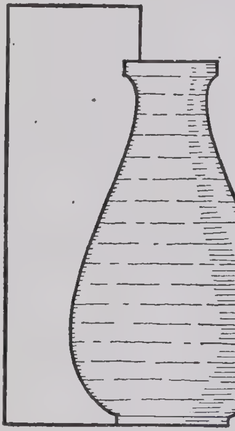


Fig. 3

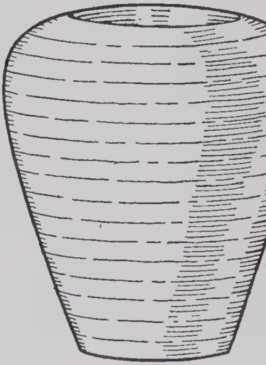


Fig. 4

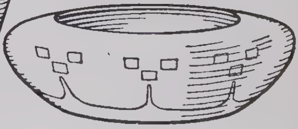


Fig. 9

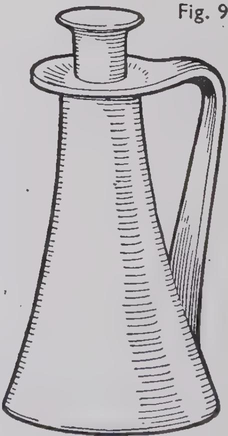


Fig. 7

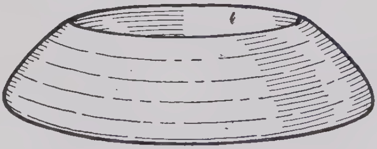


Fig. 5

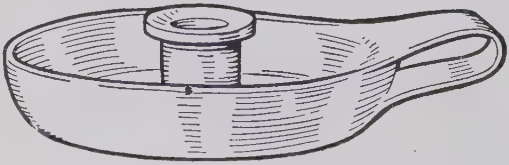


Fig. 6

the fingers quite a large variety of pots can be modelled.

Methods of firing are discussed later on.

Making a Coiled Pot.—Knead a double handful of clay until thoroughly mixed, form it into a ball, and roll it on a flat wet surface to form a short stumpy cylinder. Now roll it with both hands into a long cylinder about ½ in. diameter. You will find it necessary to adjust the pressure of the hands so that the roll is gradually and evenly elongated without any ridges. Make several of these. Now coil one roll to form a circular base of a pot, say 5 in. diameter, press it flat and weld the coils together to make a solid mass, see Fig. 1. Take another roll and coil it on the edge of the base, round and up, each ring being pressed firmly on the one below to press out air cavities which might blow out on firing, see Fig. 2. Level off the top and use the finger ends of one hand to stroke and weld the coils together on the outside while the fingers of the other hand are being used inside the pot to support the clay against the pressure from outside. Figs. 4 to 9 show the kind of useful article which can be made by coiling. The shape develops from a simple cylinder to more difficult curves as the skill in coiling is developed. A template of tin or zinc plate can be used to control the shape, as in Fig. 3.

Decoration can be added by means of incised lines either left as traced or filled in with a clay of another colour, pressed in when the shape is rather dry and tough. Clayslip—liquid clay—of another colour can also be used as a paint and decoration painted on with a brush.

Making Pots from Slabs of Clay.—Square or any rectangular shapes can be built up by using flat slabs of clay, about ¼ to ⅜ in. thick according to the size of the article. The slabs are easily and quickly made by nailing two laths ¼ to ⅜ in. thick 10 or 12 in. apart to a table top. Wet the surface and beat or roll out a layer of clay in the hollow, filling it completely. Scrape off the superfluous clay with a straight edge and use a rolling-pin to flatten the top surface. Mark out through a paper pattern on the surface, the shapes and sizes of the parts of the pot to be built (see Fig. 10). Run a thin knife round each shape but do not cut quite down to the table. Cut along the inside edge of each strip to allow the whole slab to contract evenly and leave it to toughen slightly. This makes it easier to handle the slabs without fear of spoiling the shape.

To assemble the parts, prepare a roll of clay, hold one of the sides against one side of the base and work a piece of coil firmly into the angle between the two parts, pressing the edges well together (see Fig. 11). Each side is dealt with in this way and the vertical angles well filled in with the roll of clay. It may be necessary to use the wooden tools instead of the fingers on the tall shapes. Suggestions for shapes are given in Figs. 12 to 15.

Drying.—Pots should be very carefully and thoroughly dried before they are fired. Slow drying is always safe. It is not wise to attempt to hasten the drying process by placing the pot in front of the fire or in the sun or in any place where one side may dry more quickly than the other, unless it is certain that the pot can be turned very frequently. A cupboard over a radiator is useful, a small gas ring or bunsen burner under the bottom of a biscuit tin, with the pots supported so that they are not in contact with the warm metal, or a long period in a warm room may each prove an efficient means of drying. The gas oven may also be used. It must be realised that a good deal depends upon the amount of care

latter with oil to prevent adhesion and cast liquid plaster on to the other half of the positive to a depth of 1½ or 2 in. above the highest point. When the plaster is set, remove the sides of the box, divide the two halves of the mould, and take out the clay positive. The holes which were cut in the lower half of the mould will now be seen to have formed corresponding projections on the upper half. These act as guides to the perfect fitting of the two halves of the mould. Cut a large hole in the top of the shape to provide a channel through which liquid clay-slip can be poured.

Paint the inside of the mould and the adjacent surfaces with a mixture of soft soap, water and paraffin oil until they are no longer absorbent, when they should be rubbed with a piece of soft rag. Paint the surfaces with oil.

Tie the two halves tightly together. Mix clay with water to a thick creamy consistence by rubbing small pieces of clay in water through a fine sieve. Leave to mature, stirring frequently. Pour the slip into the mould till full; as the slip subsides, fill up again. When a sufficient thickness has been deposited—this can be tested by scraping round the top of the hole—empty out the slip into a bucket. Leave to dry for a few hours, ease off the mould, trim the edges and joint line of the casting and leave to dry. Clean up with fine glass-paper, if necessary, wipe over with a damp sponge and proceed as previously described for "Drying" and "Firing."

Glazing.—Glazing the biscuit ware, as the fired pottery is called, is by far the most exciting part of the craft. It may also be the most disappointing. Glazes can be purchased from merchants at the potteries and full instructions regarding their melting points, etc., can be obtained.

To carry out good glazing you will need a clean form of heat. A properly-built kiln is really necessary. The biscuit ware is coated inside and outside with glaze of a creamy consistency either by spraying, dipping and pouring or painting, and refired until the glaze runs freely. The heat of the kiln should be raised quite slowly and after completion of the firing cooled down very slowly to avoid cracking in the glaze.

Tilemaking.—Tiles may be made of various kinds and sizes. A box or frame of similar arrangement to Fig. 10 and of a size to give the tile required in length, breadth and thickness is necessary. The length and breadth can be varied in the frame by having adjustable cross-bars. The depth necessary for small tiles is about ⅝ in. Dust the mould with french chalk or dry clay dust to prevent sticking and press a slab of clay into it. True up and toughen the surface by rolling and scraping with a straight iron edge. The tile is removed by running a knife round the edges and tapping the back of the frame. Leave the tiles to dry and toughen before firing.

Tiles with raised pattern require a frame about 1¼ in. deep. Cast a layer of plaster ⅝ in. thick into the frame, take out and smooth off a level top surface. Draw the design of the tile on this surface by transferring it from the paper. Then incise it with a firm point, such as a hard pencil, to give finally a rectangular depression about $\frac{1}{24}$ in. deep. Place this plaster mould back in the wood frame and press the clay tile on to this negative to obtain the positive projection of the design.

Simple, strong designs are preferable to thinner and weaker ones.

The production of pattern on the surface can also be carried out by squeezing slip clay from a tube or tracer in the same manner that icing is put on to iced cakes. Glaze should be applied very liberally in this work.

CARDBOARD WORK

So many of the things around us which are made from paper and cardboard can be so easily and profitably made at home that we give in this section a number of variations on some well-known ideas.

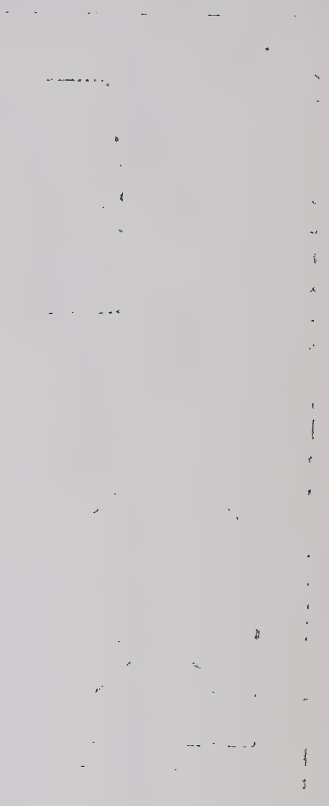
Materials.—The equipment required is small and inexpensive. An ordinary pen-knife, a non-slip rule, a 6 in. 45 deg. set-square, paste, paste brushes, glue-pot, tool for fixing press studs, bookbinder's awl, leather punch, scissors, a light hammer and a piece of wood covered with rather fine emery cloth for use in sharpening the knife. A small guillotine will be useful for cutting cardboard, and one or two presses would be useful though not absolutely essential.

Greeting Cards.—This is an idea which will enable you to send cards of distinction, unlike any others your friends are likely to receive. There is scope for imagination in designing greeting cards. These are made from thin coloured cards or stiff paper which may be purchased in large sheets from the stationer or art dealer. The sheets with a rough surface make up very attractively; for the inside leaves use a coloured paper to match. The ribbon or cord which ties the cover and leaves together as well as the ink in which the greeting is written should also tone in with the general scheme. For example, if you use a warm dark brown colour for the cover, take a fawn coloured paper for the inside, a fawn ribbon or cord, and write the greeting inside in a dark brown ink and outside in a fawn coloured ink. The latter can be purchased ready for use, but they are easily made up from ordinary poster colour, another scheme could be dark grey cover, light grey inside, light grey ribbon and black indian ink. Still another attractive scheme would be light grey card, pale orange colour for the ribbon and the inside, and dark brown ink.

Once you begin making cards along these lines you will find that ideas come along fairly easily, and you will be able to devise new shapes and work out your own colour schemes.

Envelopes.—How many times have you wished you had an envelope of a special shape and been unable to buy one? On page 374 are a few suggestions for making envelopes of various shapes and sizes for a variety of uses. For strong work use manila paper, or strong brown paper of any kind; for lighter work ordinary cheap cartridge paper serves quite well. Fig. 7 shows an envelope with a gussetted side and bottom. This is a useful container. If three or four more of these are made without the flap they can be stuck firmly to the front of this one and so make a very useful folio for papers, see Fig. 8.

Filing Covers and Albums.—Covers to contain papers of any kind, for use as holders for your writing pad, and also an album for photographs, films, cigarette cards are easy to make, cost very little indeed and may be just as useful and attractive as anything of the kind that you can buy. Fig. 9 is a simple cover which is made of manila or other strong paper. The holder for the papers is a large envelope made as previously described. The two are held together by a piece of cord or narrow tape passed through a hole punched in both cover and envelope. The cover



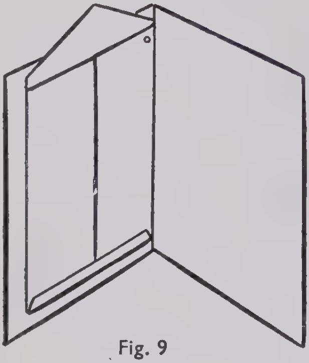


Fig. 9

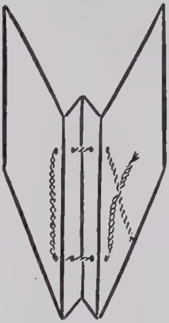


Fig. 10

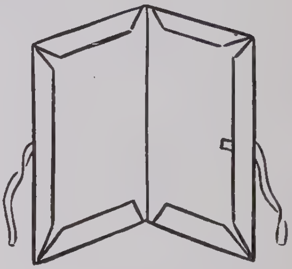


Fig. 11

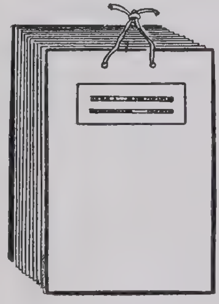


Fig. 12

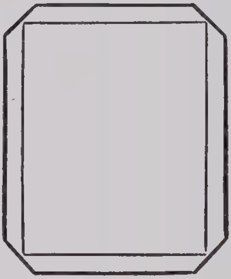


Fig. 13

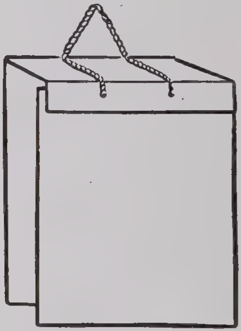


Fig. 14

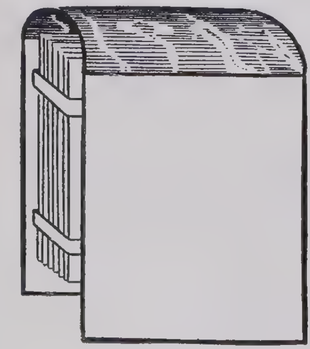


Fig. 16

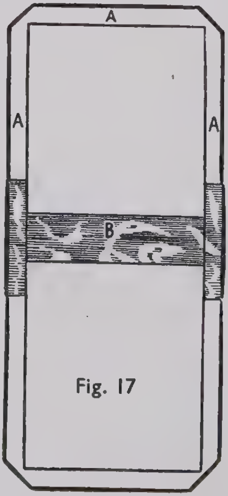


Fig. 17

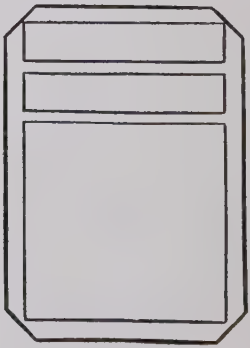


Fig. 15

form the inside of the album. These should measure in length from xx to ¼ in. from the front edge and ½ in. narrower than the cardboard covers, i.e., in this case 3½ in. Punch holes through these sheets and through the cover as shown and fix all together with a piece of cord. Do not fill the cover to capacity with leaves of paper, or there will be no room for the pictures when they are put in.

The method of fixing the latter is either by means of slits in the leaves through which the corners of the picture are slipped or by means of small adhesive paper discs which can be purchased very cheaply at the stores. They are decidedly less troublesome to use than any system of slits in the leaves.

A much larger example of this album can be used as a cover for any papers it is desired to file or for large pictures. This idea is quite useful for storing the pictorial records of various holidays, an album for each holiday. It should be borne in mind that the larger the size the thicker the board should be. For very large work it is necessary to use cardboard about ¼ in. thick. Do not think that it is necessary to purchase cardboard of this thickness; it can be made up by pasting or gluing together sheets of smaller thickness. It is much easier to cut the thin sheets to size and then stick them accurately together than it is to attempt to cut a board of ¼ in. thickness, i.e., unless a guillotine is available. Another point to remember is that cardboard from old boxes, advertisement cards and so on will serve just as well as any new material for all this kind of work.

Calendars.—Here is another idea which can be profitably made up in a great variety of ways at once attractive and saleable. For much of this work what is known as pastel board is necessary. This is a thin cardboard with a pleasant soft coloured surface. Both sides are almost alike. Browns, greys, blues, orange colour, soft greens, and similar shades and tints can be purchased in good variety from a good stationer's shop or art stores. A suitable picture can be used as the main decorative feature, or the manuscript pen might be used to work out a simple border design.

The Colour Schemes are very important in all this kind of work. The pictures must tone with the background. If the large piece of cardboard or thick paper used for the back is anything from cream to brown in colour, a picture in shades of brown will be safe to put on it. It is generally advisable to cover the front of the small calendar with a piece of the same paper or thin card, or a paper in a lighter or darker shade or tint. Another point which is helpful is this; if the background is dark in colour, let the picture and cover to the calendar be in a lighter shade; if it is light in colour, put on a picture and calendar cover which is darker. In this way simple contrast is obtained which adds quality to the whole. Further, if ink is to be used, make it from ordinary poster colour and make it to tone or contrast with the paper. Cream coloured ink on a brown background, orange colour on blue, greenish yellow on purple, brown on cream, green on red and so on are all good to use.

When you have mounted a picture on a background you may feel that you have not quite secured the result you wanted. Try the effect of a line drawn about ¼ in. away all round the picture. The ink should be of a colour to contrast with the background. It will generally sharpen up the whole composition and give you a far finer result.

Blotters, Writing Pads and Cases.—There is a great variety of forms into which these useful cases, etc., can be

one on each side to the end papers and the muslin. Cover the top piece with coloured paper, folding over the edges on to the inside and then paste back another sheet of the pad to cover the folded edges.

Magazine Cover.—Fig. 24 shows the details of the cover which can be used to protect any kind of weekly magazine which may come into the house. It is made from three pieces of thick cardboard. The centre back piece is only about ½ in. wide. It may be omitted and the same space allowed between the large pieces of cardboard. When the outer piece of cloth is fixed, two holes are punched in the position shown, a piece of cord or a narrow tape threaded through and the ends either knotted outside each hole or they are continued outside the back and tied together. The paper or magazine is opened at the centre and threaded underneath the cord.

Coloured-cover Papers.—In all this work it is very interesting to make your own coloured papers for use in covering. Distinctive colours and patterns can be obtained in a variety of ways.

Paste-coloured Papers.—A very simple method is as follows: Take a sheet of plain paper, not too large, either coloured or white, paint it with water and then with thin paste. A thin flour paste does quite well. Now mix some water colour, rather thick, and put dabs of it all over in any sort of way. Work the paint so that it covers the whole of the surface. Begin to work pattern into this film of colour by dabbing it with the brush or making zig-zag lines with it. Or, take a small sponge and dab the surface regularly. Or again, cut teeth in the edge of a piece of stiff cardboard and comb pattern into the colour. Even the finger ends may be used to make pattern, or a screwed-up piece of paper. You will find that you can obtain quite distinctive patterns in some odd way which no one else has thought of. If you use coloured paper as your background, you can increase the colour interest of the work. Mix the separate water colours on the paper and obtain a variety in the surface itself.

These papers are useful both as cover and as lining papers and they can be used with the best class of work.

Oil-coloured Marbled Paper.—papers made by the following process can be used on the very best work in cardboard or bookbinding. Any one can obtain really first-class results if a little thought is applied while carrying out the operations.

The Materials (Paper). — Any plain-coloured clean paper will do—e.g., white drawing paper, coloured pastel paper, rough or smooth (unglazed) brown or other packing paper, or the back of suitable wallpaper.

Oil Colours.—Half-pound or pound tins of oil colour as sold by the ironmonger or colourman. The small tins of oil colour sold by artists' colourmen are cheap and give very good results.

Paraffin or Turpentine.—One of these (not both together at any time) to be used as a thinner for the oil colour. Paraffin is cheaper than turpentine and generally more easily obtained, but not quite so effective.

Brushes.—For use in mixing the colours and splashing them on the size. Any small paste or paint brushes will do.

Combs.—Any hard-pointed instrument will serve as a comb—e.g., a metal meat skewer, an old comb, a pencil point or a fork—or a comb may be made by driving nails, say 2 in. long, at intervals through a piece of wood ¾ or 1 in. thick × about 2 in. wide, or smaller nails through a thinner piece of wood.

Tray.—A tin tray may be made from

a biscuit-tin lid, but this is rather small. A good useful one is made from tin plate 19×15 in., turned up 1 in. all round and the corner joints soldered so that they are watertight. This gives a tray 17×13×1 in. deep, large enough for paper 15×11 in.

Method.—Dissolve 2 oz. of paper-hangers' size in 1 pint of boiling water. When completely dissolved, add water to make up to about 2 quarts. Pour into the tray and leave until cold. To test the size in order to ascertain the right state of fluidity, slightly lift one corner of the tray. The size it contains should run freely and not show any part of the surface which is "jellied" and does not run. If any part of the surface is like jelly, stir in a little more hot water to reduce the stickiness.

The Colours.—Put a brush full of oil colour in a jar and add about the same quantity of turpentine and stir well. Mix up the necessary variety of colours.

Preparation of Colour and Pattern on the Size.—With a brush for each colour, splash spots of colour on to the surface of the size. If the colour thins out quickly on the size and loses practically all its strength it is too thin; add more colour to the mixture. If the colour sinks to the bottom of the size, it is too thick; add a little more turps or paraffin to the mixture. Having applied the various colours which are required in the scheme—two or at most three colours are sufficient—begin to work up the pattern with the combing tool. When satisfied with the effect, take a sheet of paper, hold it by two opposite edges, allow it to dip in the middle and lower it gently on to the surface of the size. Tap the sheet all over to ensure that the whole of the surface is in contact with the size and to exclude all air bubbles. Take hold of opposite corners of the sheet and lift carefully. Allow the superfluous size to run off into the tray.

To Dry the Print. — Place the printed sheet in front of a fire or on a radiator. A second print may be taken off. It will be thinner than the first and will serve for end papers for books, while the first print is used for cover papers.

Ironing the Paper. — When the printed sheet is dry, it may be perfectly flattened by ironing with a hot iron, applied on either the marbled or the blank side of the paper.

Hints.—The size "goes off" in about twelve days and should be thrown away and a new lot made.

Clear the size after each print, or two prints, by drawing through the size a folded piece of newspaper. This will lift off any spots or bits of colour.

In working the pattern draw the tool slowly through the surface of the size and so avoid breaking up the colour too much. More definite pattern can be obtained in this way and the colour is not driven to the bottom of the size. Avoid large unbroken patches of any one colour. If smaller quantities are to be dealt with, tubes of ivory black, Prussian blue, emerald green, raw sienna and scarlet oil colours will be found to give a wide range of colour effects.

Any shades of colour it is required to print must be mixed in the jars before applying to the size.

dowel rod slipped into holes in each piece at a corner. These fit fairly loosely so that they can be easily withdrawn when necessary. Small pointed irons bent and used as in Fig. 3 can also be used. This framework acts as a mould into which the mixed cement is placed.

Garden tiles do not need to be made of a very fine texture so the mixture of cement, sand and gravel will be fairly coarse. Take one measure—say one shovel or one bucketful—of cement, two measures of sand and three of gravel, and pour them out on to a flat board. Mix them thoroughly together with a shovel while dry. Then add water through the rose of a watering-can and mix thoroughly until a good plastic mass is obtained. Now shovel some of the mixture into each mould or frame until they are all filled level with the top edge. Leave these to set for two days and then remove the frames by pulling out the pegs or iron dogs and tapping the pieces of wood with a hammer to remove them from the edge of the tile. While the tiles are setting, you should prepare the bed of the path which is to be tiled.

Laying the Tiles.—The tiles can be laid dry on a bed of ashes. The joints can be filled in with cement and sand mortar or they may be filled with soil and small flower seeds sown in them. The size of the tiles may be made to suit the width of the path.

Various colours may be introduced if required by mixing powdered colours such as yellow ochre, various reds, burnt sienna, burnt umber, lamp black, and so on, with sand and cement and water. A thin layer of this is put into each mould.

Small Tiles.—Small tiles with patterned surfaces can be made quite simply. These tiles make quite distinctive presents for your friends.

If you wish to make tiles which are quite plain in colour, proceed as above described, using a mould which is only $\frac{3}{8}$ in. deep. Make up a mixture of one part of cement to one of fine sand, with colour as desired.

These small tiles are quite easily made in the house, care being taken not to stir up the cement so much that it is scattered in the air. Patterned tiles are far more interesting to make. The pattern may be in colour, incised or raised ornament. A pattern which can be worked out by anyone of these methods is given in Fig. 4.

Coloured Tiles.—To carry out this idea in colour, prepare the mould as before to the size of the tile; 6 in. square is the usual size. Draw the pattern on a piece of stiff paper. Mix neat cement with colour and sufficient water to make it plastic. Take a small brush and paint this mixture on to the pattern to a thickness of about $\frac{1}{8}$ in. Place this while wet into the bottom of the mould with the cement pattern upwards, see Fig. 5. Mix one part each of cement and fine sand with water and fill the mould. If a number of moulds are made, the production will be increased. Leave the mixture to set for two days. Knock away the moulds and remove the paper. The pattern will be found to be in colour on the surface.

Sunk Pattern.—The pattern in Fig. 6 can be sunk in the surface by cutting out the squares and so leaving the cross and border in a piece of cardboard which fits into the mould as shown in the illustration. Place this cut out pattern on the bottom of the mould and fill in the cement mixture as before. Leave to set for two days, take away the mould, tear off the cardboard, and so obtain a recessed pattern. This is carefully filled with a coloured cement mixture and left to set for a few days.

Made and Printed in Great Britain by C. Tinling & Co. Ltd., Liverpool, London and Prescot. *S/146/2R/S*